FIG.1

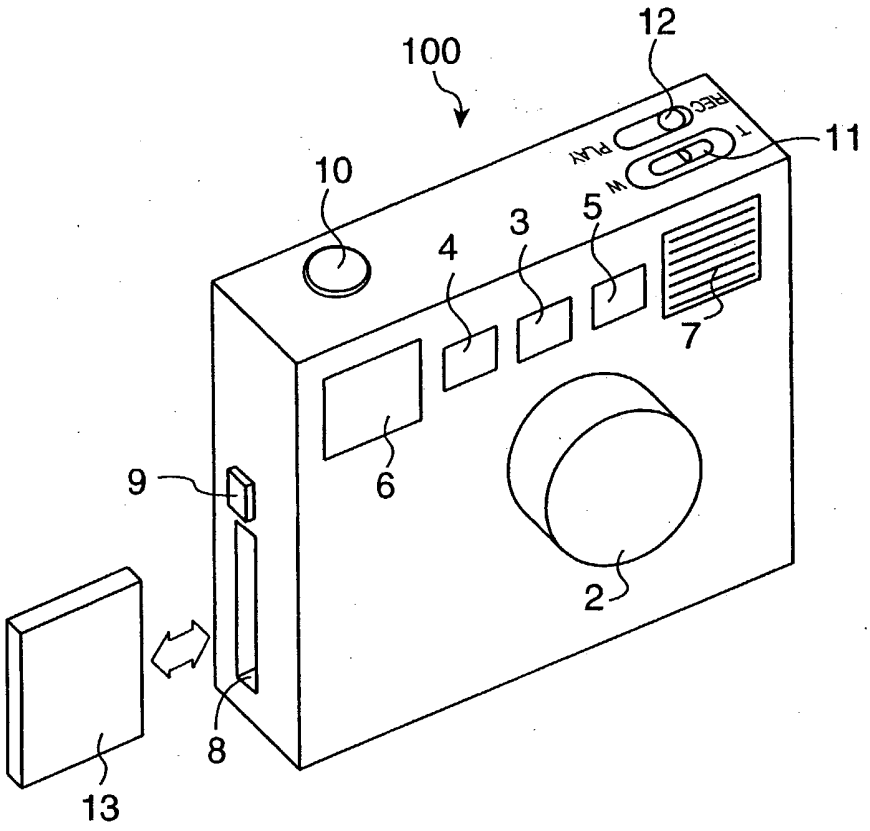


FIG.2

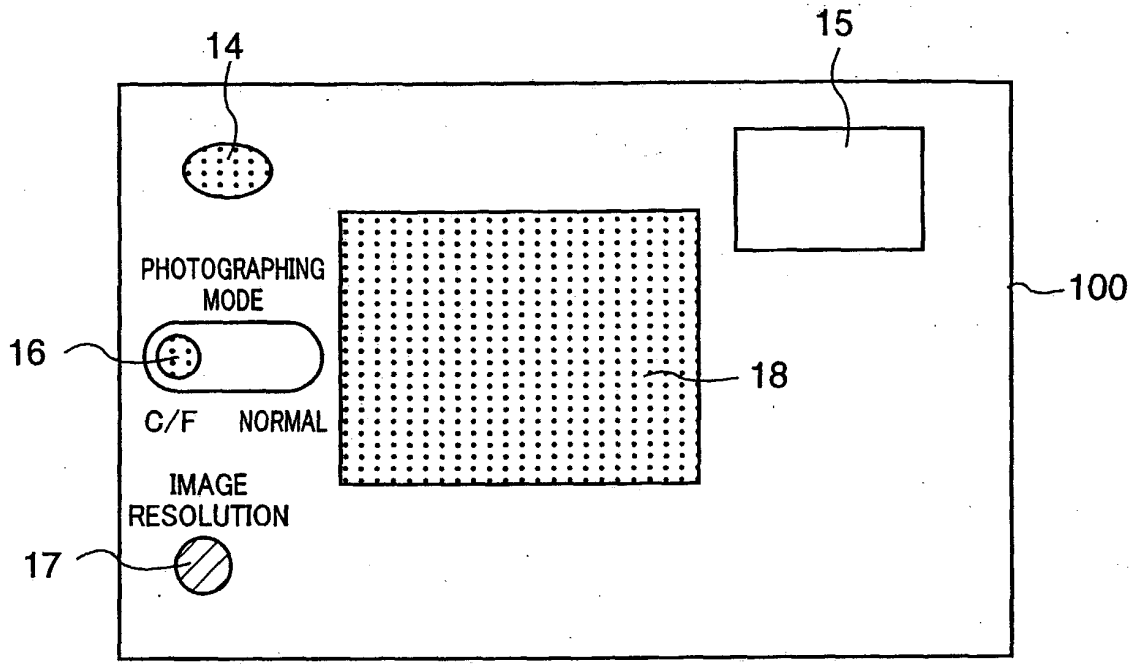

14
15
PHOTOGRAPHING MODE
16
C/F
NORMAL
18
100
IMAGE RESOLUTION
17

FIG.3

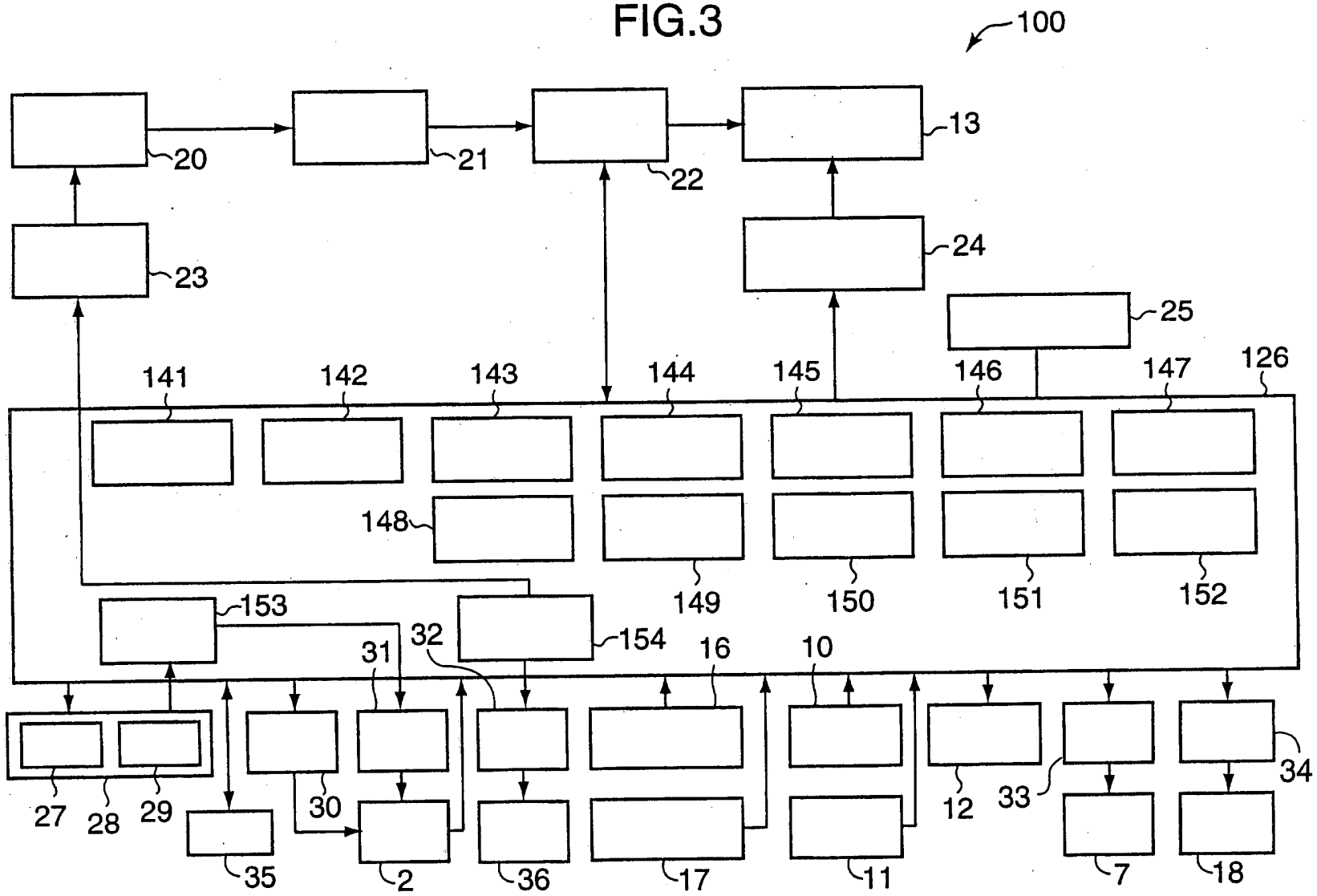

100
20
21
22
13
23
24
25
141
142
143
144
145
146
147
126
148
149
150
151
152
153
154
31
32
16
10
27
28
29
30
35
2
36
17
11
12
33
34
7
18

FIG.4

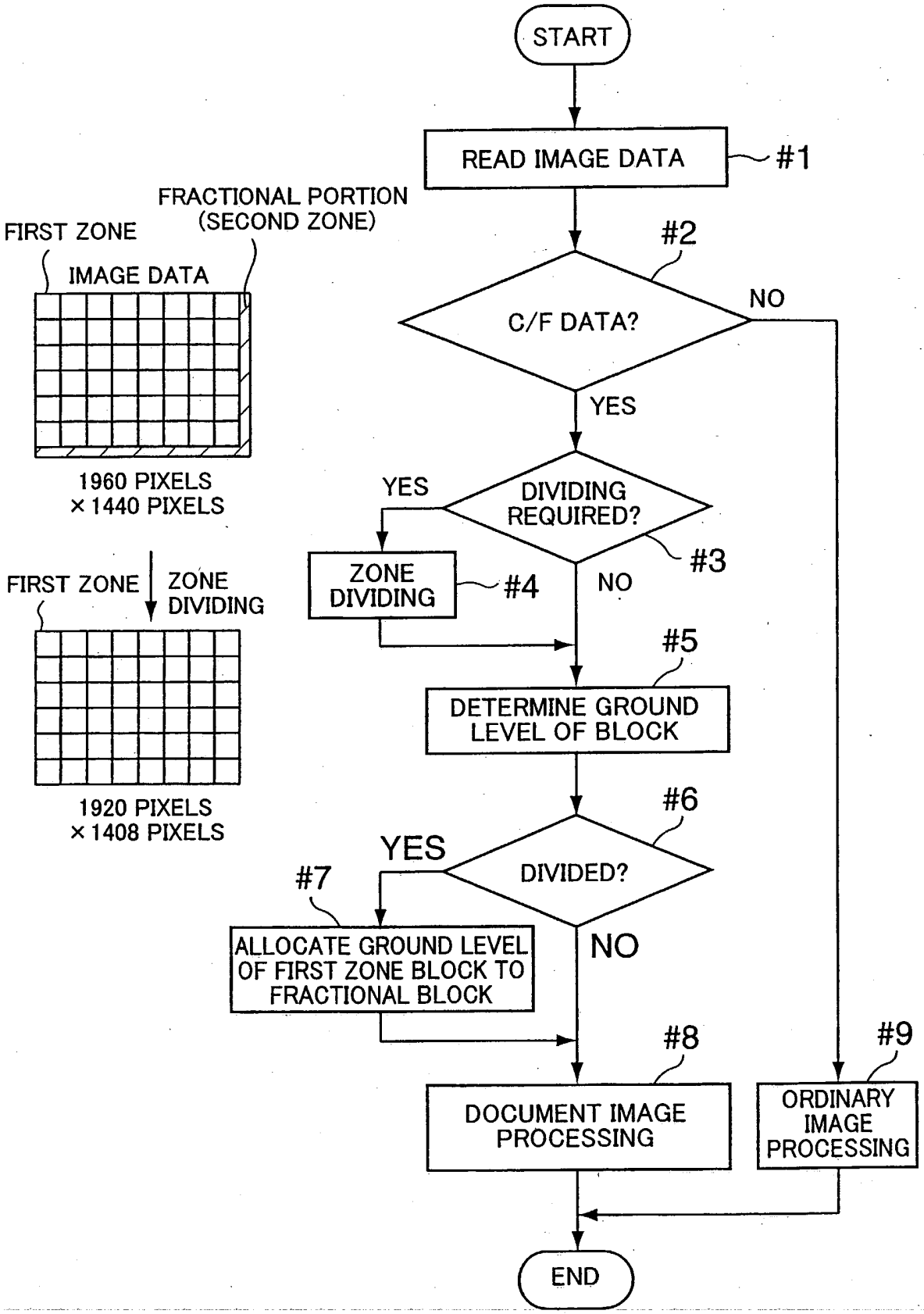

START
READ IMAGE DATA
#1
FRACTIONAL PORTION
(SECOND ZONE)
FIRST ZONE
IMAGE DATA
1960 PIXELS
× 1440 PIXELS
#2
C/F DATA?
NO
YES
YES
DIVIDING
REQUIRED?
#3
ZONE
DIVIDING
#4
NO
FIRST ZONE
ZONE
DIVIDING
1920 PIXELS
× 1408 PIXELS
#5
DETERMINE GROUND
LEVEL OF BLOCK
#6
YES
DIVIDED?
#7
ALLOCATE GROUND LEVEL
OF FIRST ZONE BLOCK TO
FRACTIONAL BLOCK
NO
#8
#9
DOCUMENT IMAGE
PROCESSING
ORDINARY
IMAGE
PROCESSING
END

FIG.5A

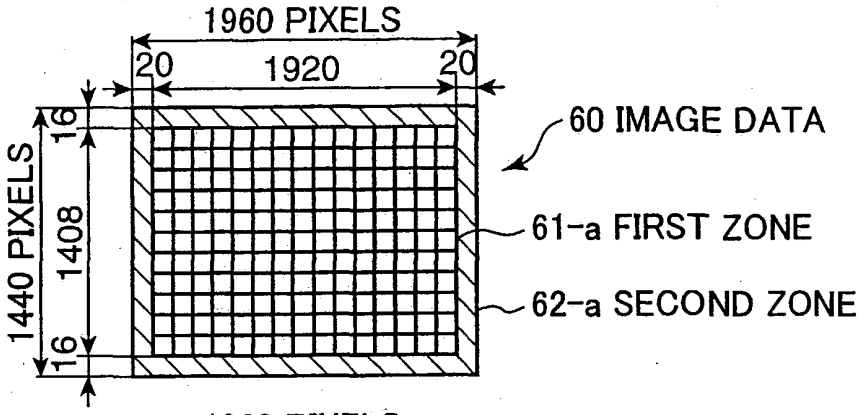


FIG.5B

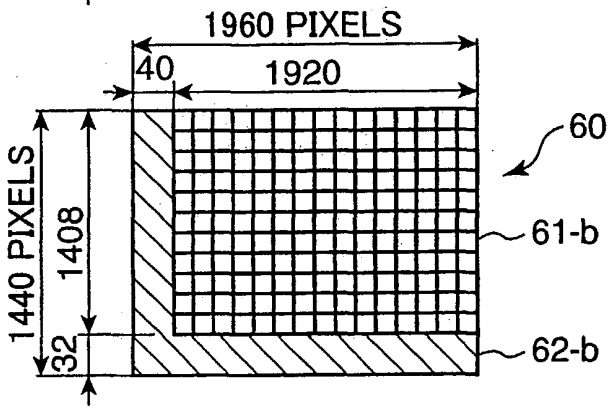


FIG.5C

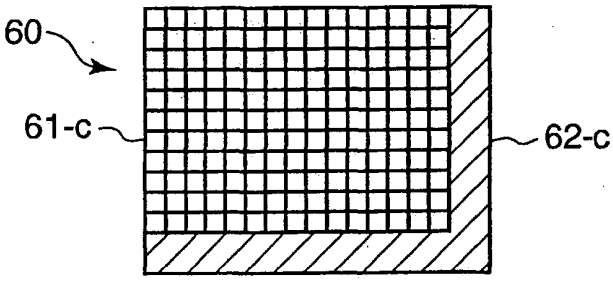


FIG.5D

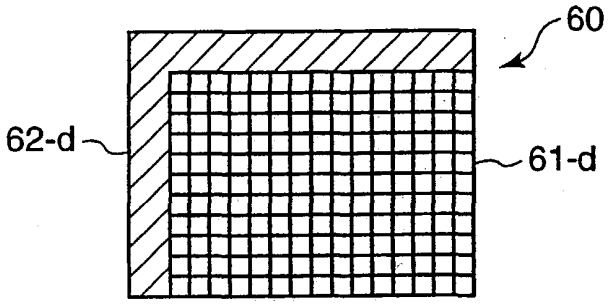


FIG.5E

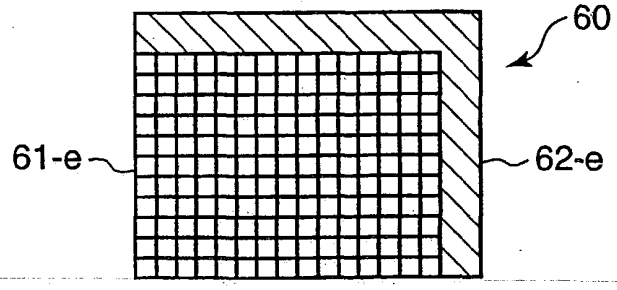


FIG.6

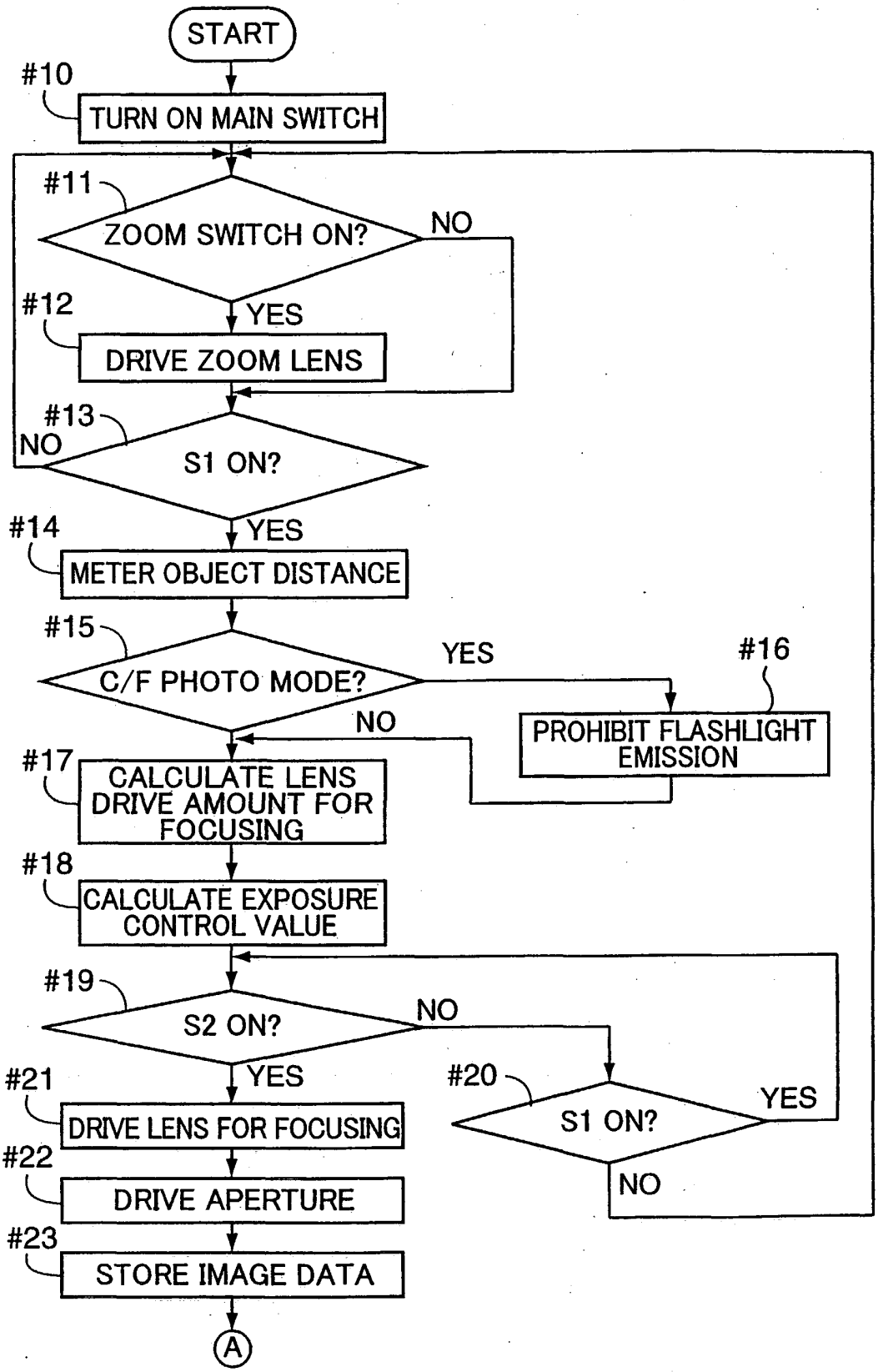

START
#10
TURN ON MAIN SWITCH
#11
ZOOM SWITCH ON?
NO
YES
#12
DRIVE ZOOM LENS
#13
NO
S1 ON?
YES
#14
METER OBJECT DISTANCE
#15
C/F PHOTO MODE?
YES
#16
PROHIBIT FLASHLIGHT EMISSION
NO
#17
CALCULATE LENS DRIVE AMOUNT FOR FOCUSING
#18
CALCULATE EXPOSURE CONTROL VALUE
#19
S2 ON?
NO
YES
#20
S1 ON?
YES
NO
#21
DRIVE LENS FOR FOCUSING
#22
DRIVE APERTURE
#23
STORE IMAGE DATA
A

FIG.7

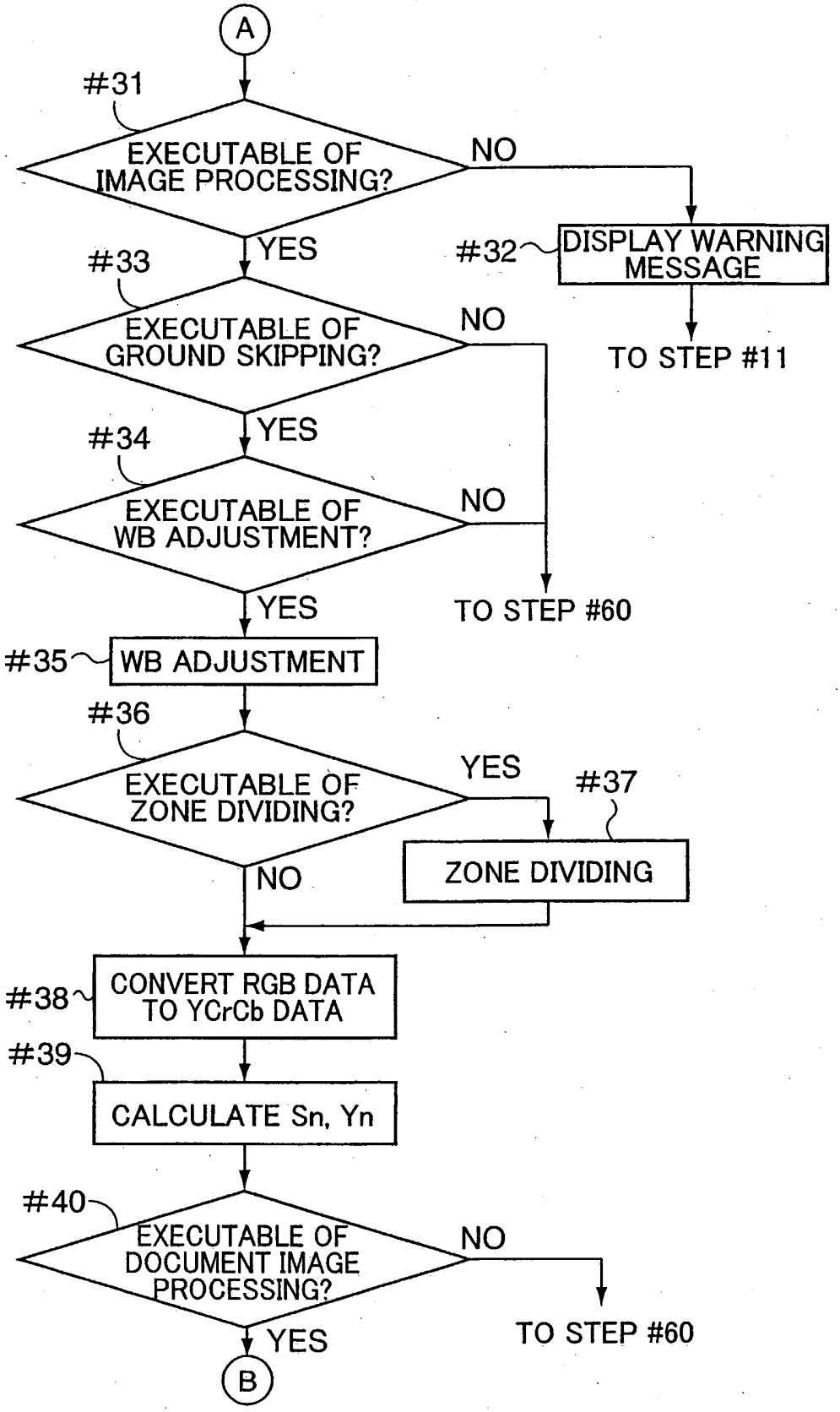

A
#31
EXECUTABLE OF IMAGE PROCESSING?
NO
YES
#32
DISPLAY WARNING MESSAGE
TO STEP #11
#33
EXECUTABLE OF GROUND SKIPPING?
NO
YES
#34
EXECUTABLE OF WB ADJUSTMENT?
NO
YES
TO STEP #60
#35
WB ADJUSTMENT
#36
EXECUTABLE OF ZONE DIVIDING?
YES
#37
ZONE DIVIDING
NO
#38
CONVERT RGB DATA TO YCrCb DATA
#39
CALCULATE Sn, Yn
#40
EXECUTABLE OF DOCUMENT IMAGE PROCESSING?
NO
YES
TO STEP #60
B

FIG.8

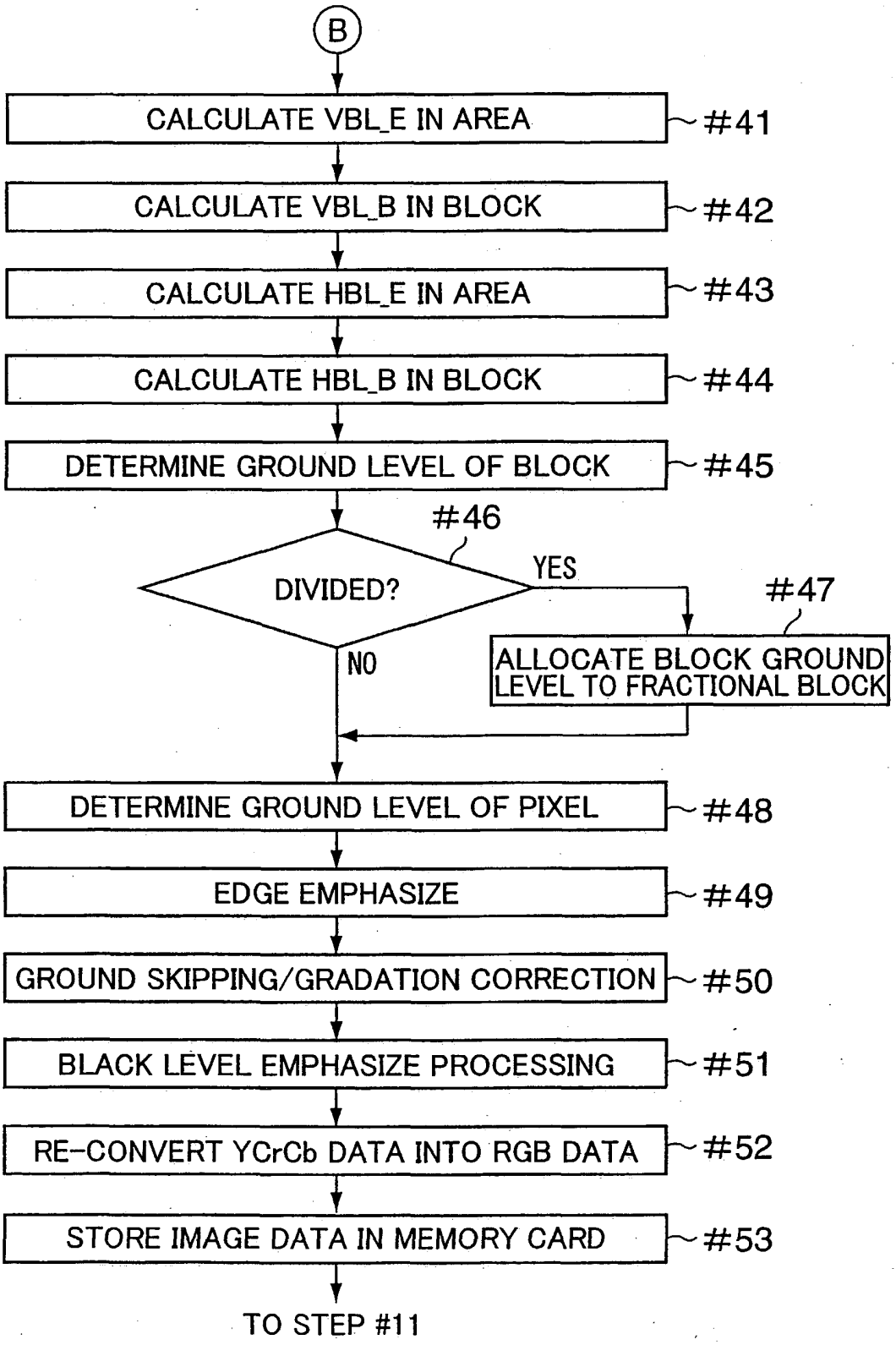

B
CALCULATE VBL_E IN AREA
#41
CALCULATE VBL_B IN BLOCK
#42
CALCULATE HBL_E IN AREA
#43
CALCULATE HBL_B IN BLOCK
#44
DETERMINE GROUND LEVEL OF BLOCK
#45
#46
DIVIDED?
YES
NO
#47
ALLOCATE BLOCK GROUND LEVEL TO FRACTIONAL BLOCK
DETERMINE GROUND LEVEL OF PIXEL
#48
EDGE EMPHASIZE
#49
GROUND SKIPPING/GRADATION CORRECTION
#50
BLACK LEVEL EMPHASIZE PROCESSING
#51
RE-CONVERT YCrCb DATA INTO RGB DATA
#52
STORE IMAGE DATA IN MEMORY CARD
#53
TO STEP #11

FIG.9

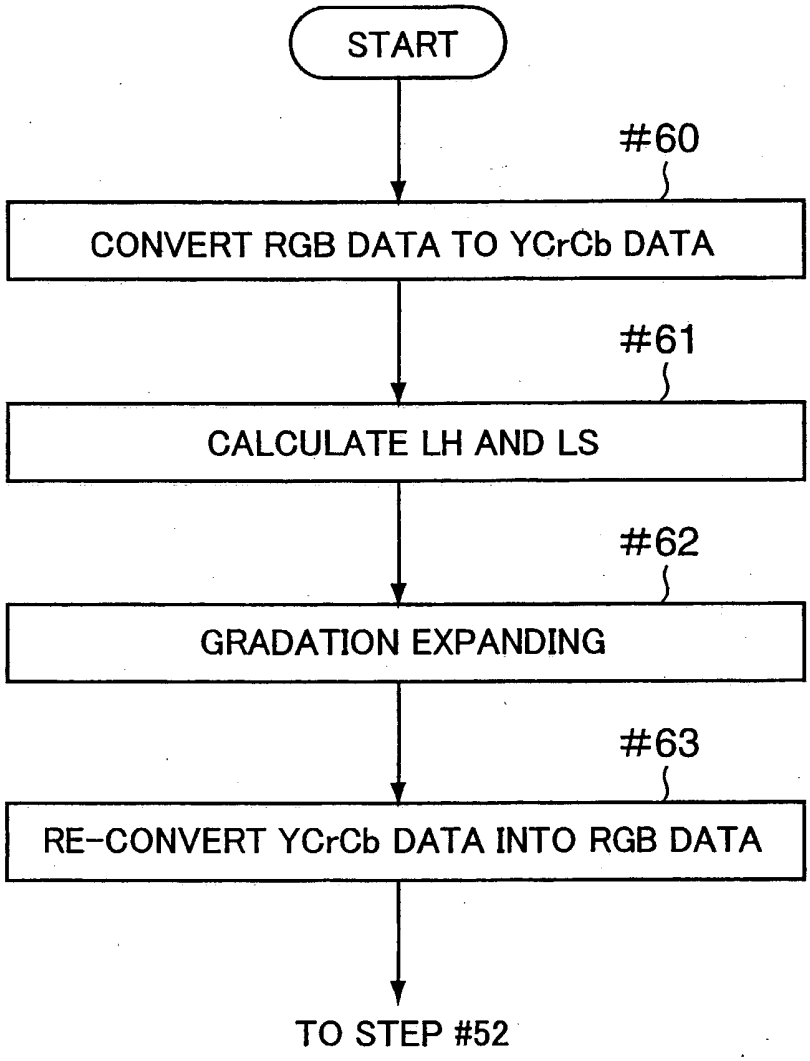

START
#60
CONVERT RGB DATA TO YCrCb DATA
#61
CALCULATE LH AND LS
#62
GRADATION EXPANDING
#63
RE-CONVERT YCrCb DATA INTO RGB DATA
TO STEP #52

FIG.10

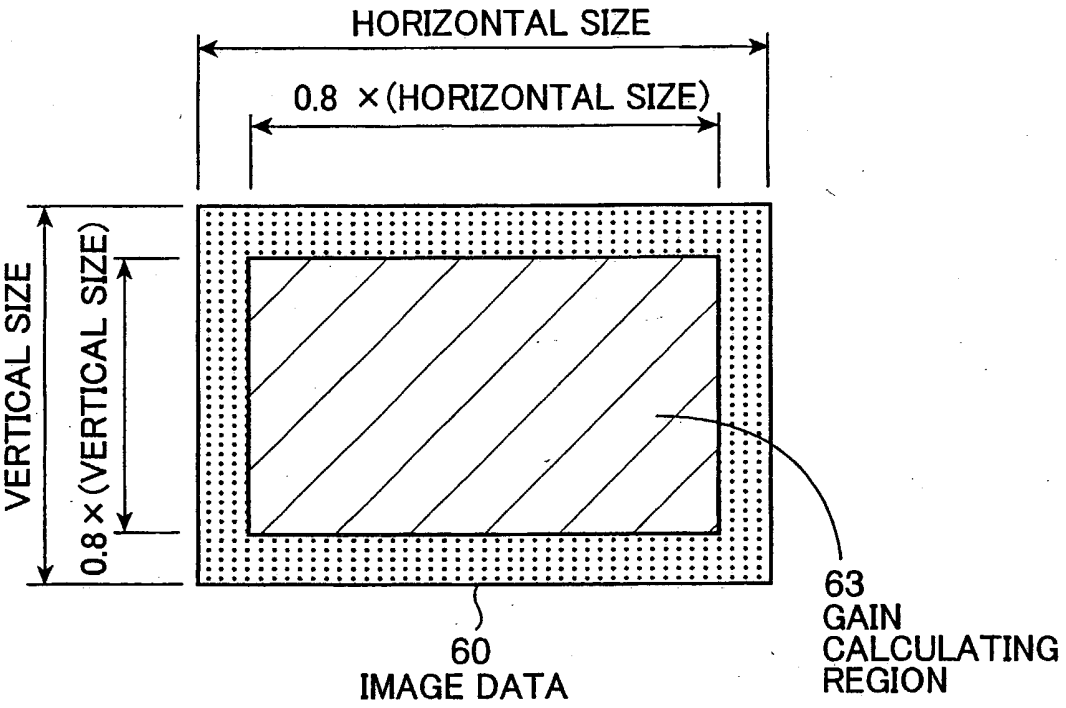

HORIZONTAL SIZE
0.8 ×(HORIZONTAL SIZE)
VERTICAL SIZE
0.8 ×(VERTICAL SIZE)
63
GAIN
CALCULATING
REGION
60
IMAGE DATA

FIG.11

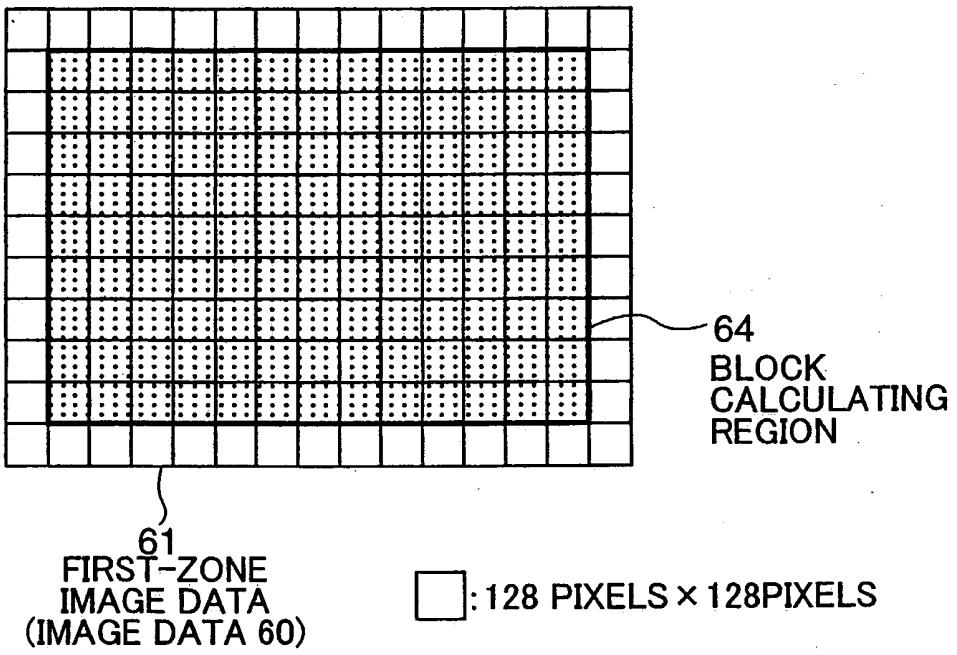

64
BLOCK
CALCULATING
REGION
61
FIRST-ZONE
IMAGE DATA
(IMAGE DATA 60)
: 128 PIXELS × 128PIXELS

FIG.12

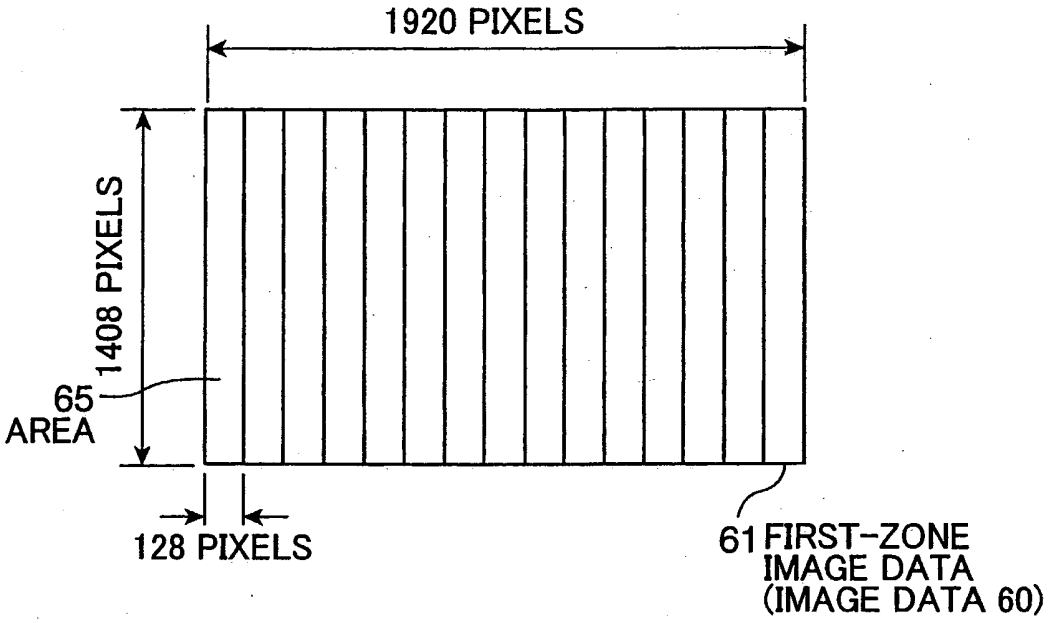


FIG.13

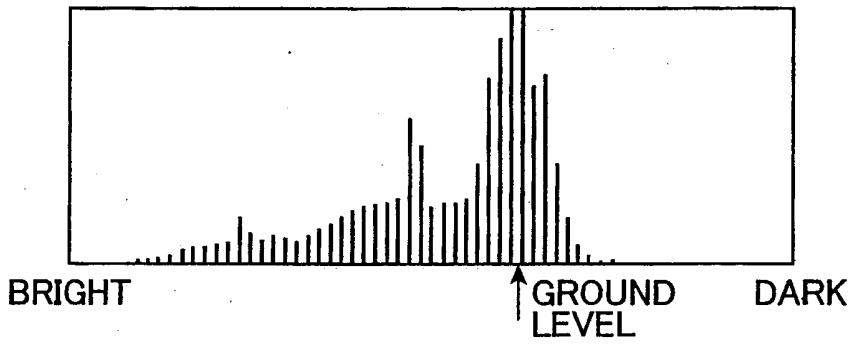


FIG.14

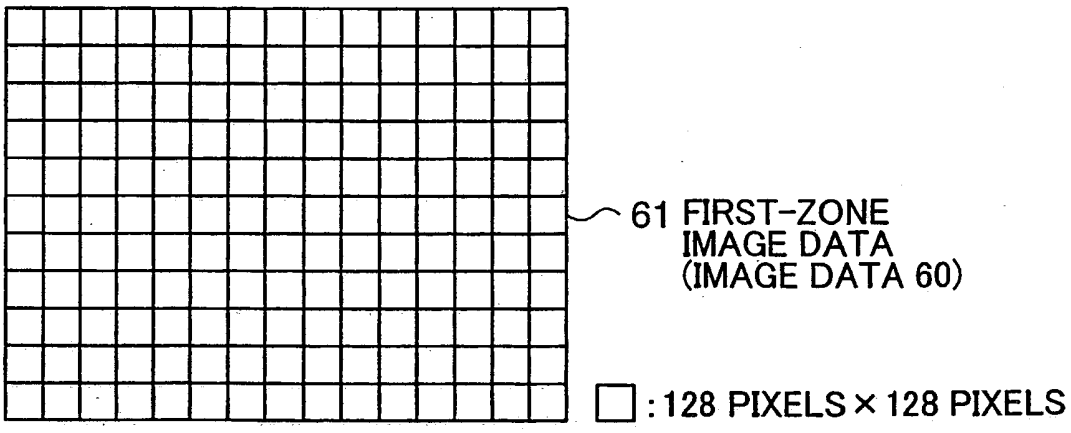


FIG.15

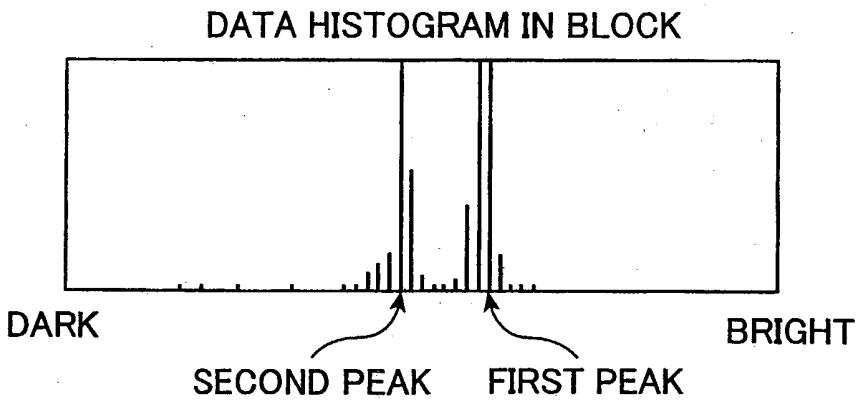

DATA HISTOGRAM IN BLOCK
DARK
BRIGHT
SECOND PEAK
FIRST PEAK

FIG.16

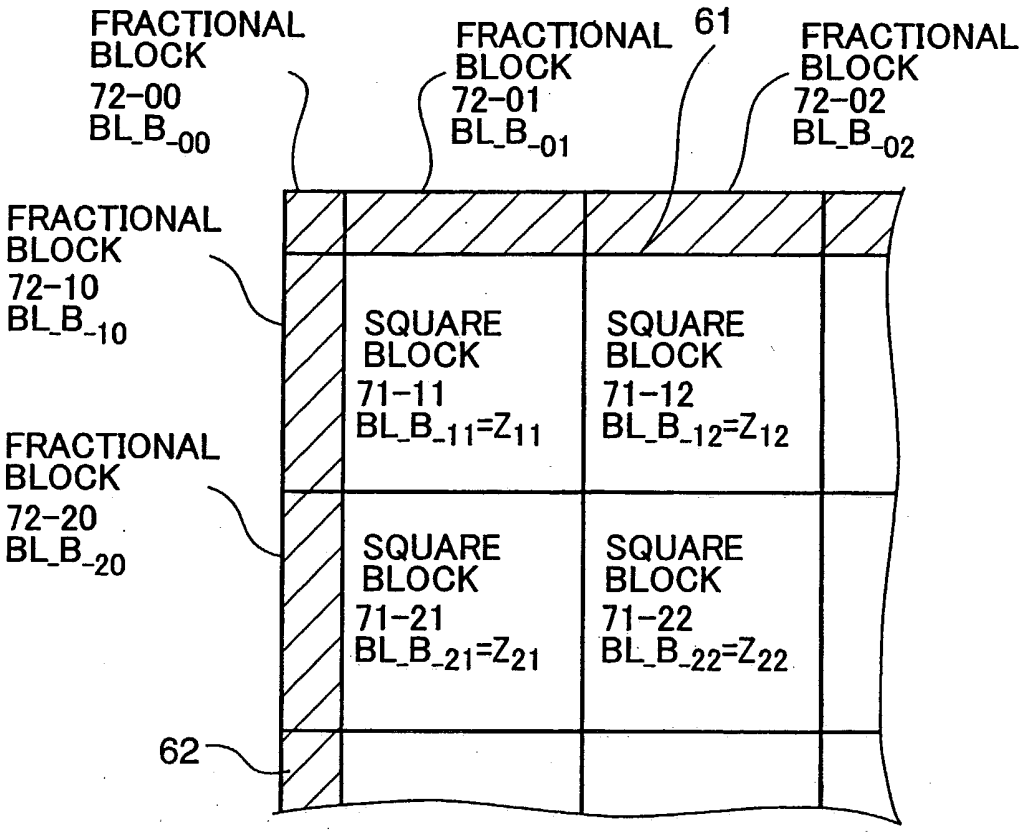
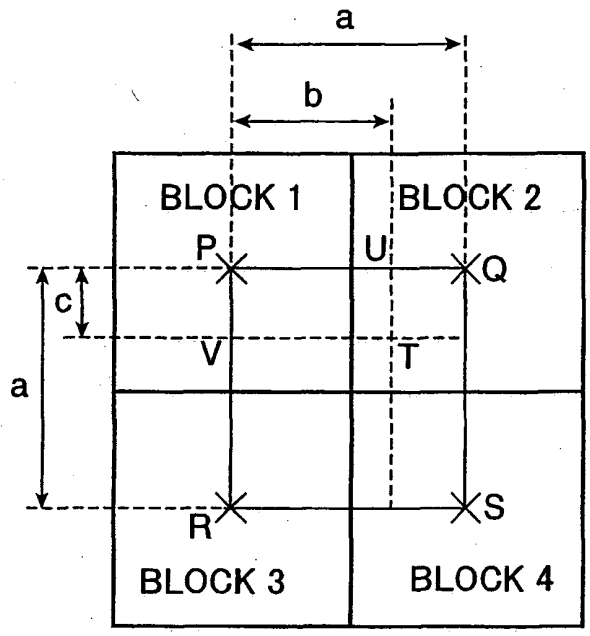

FRACTIONAL BLOCK 72-00 BL_B-00
FRACTIONAL BLOCK 72-01 BL_B-01
61
FRACTIONAL BLOCK 72-02 BL_B-02
FRACTIONAL BLOCK 72-10 BL_B-10
SQUARE BLOCK 71-11 BL_B-11=Z11
SQUARE BLOCK 71-12 BL_B-12=Z12
FRACTIONAL BLOCK 72-20 BL_B-20
SQUARE BLOCK 71-21 BL_B-21=Z21
SQUARE BLOCK 71-22 BL_B-22=Z22
62

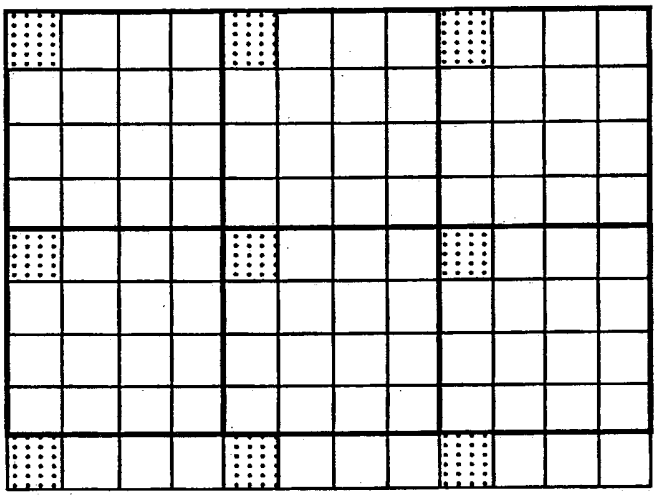
FIG.17



BL_B IN EACH BLOCK
BLOCK 1 :BL__Bp,r
BLOCK 2 :BL__Bp+1,r
BLOCK 3 :BL__Bp,r+1
BLOCK 4 :BL__Bp+1,r+1

P(0,0)
Q(a,o)
R(a,o)
S(a,a)
T(b,c)

FIG.18



: PIXEL ON WHICH GROUND LEVEL IS CALCULATED BASED ON LINEAR INTERPOLATION

: REGION WHERE THE SAME GROUND LEVEL AS THAT OF UPPERMOST LEFT-END PIXEL SHOWN BY DOTTED SQUARE IS ALLOCATED

FIG.19A

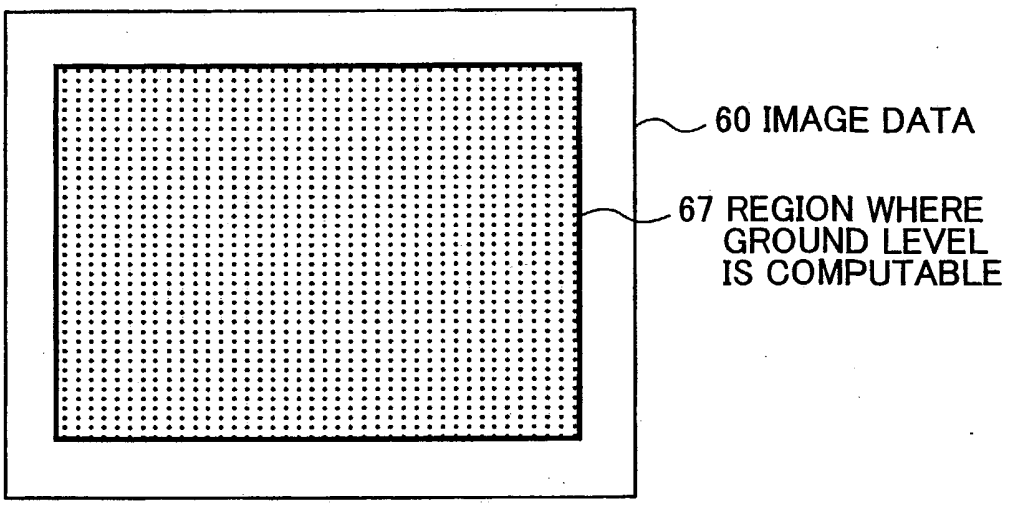


FIG.19B

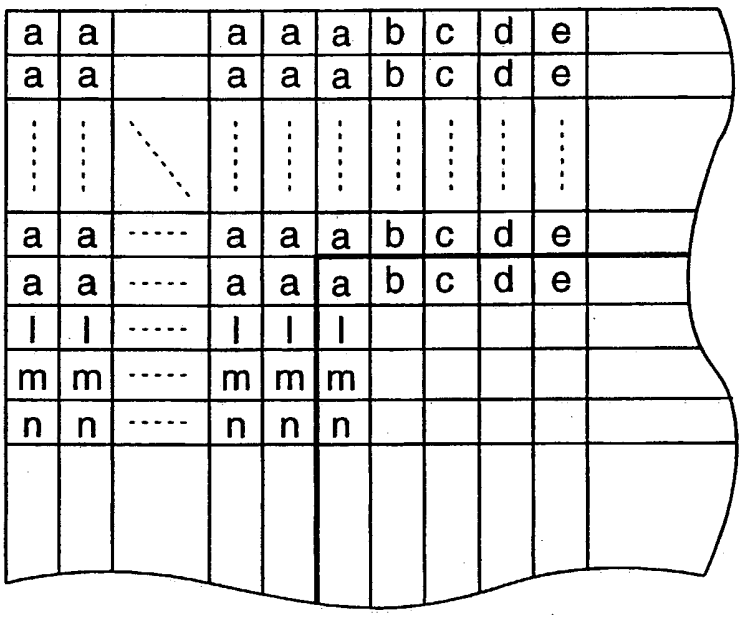


FIG.20

	-1/4	
-1/4	2	-1/4
	-1/4	

FIG.21

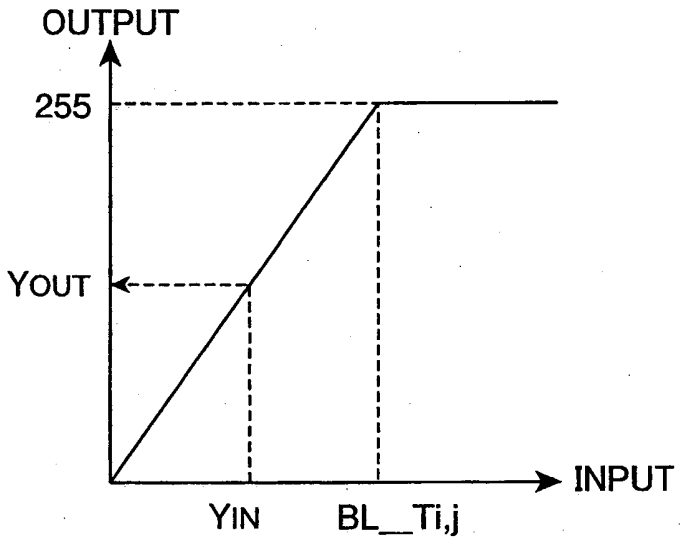


FIG.22

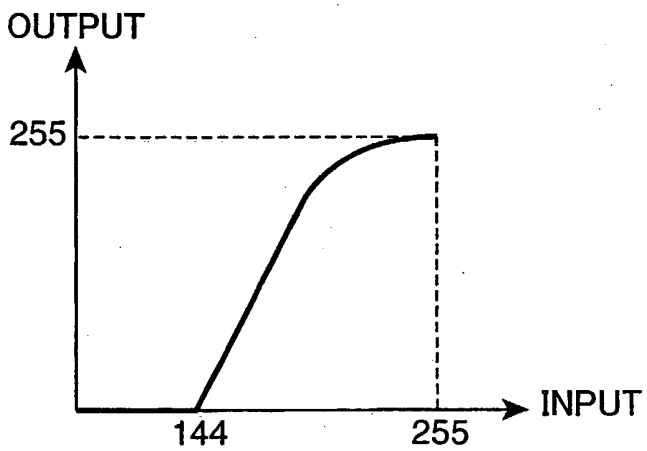


FIG.23

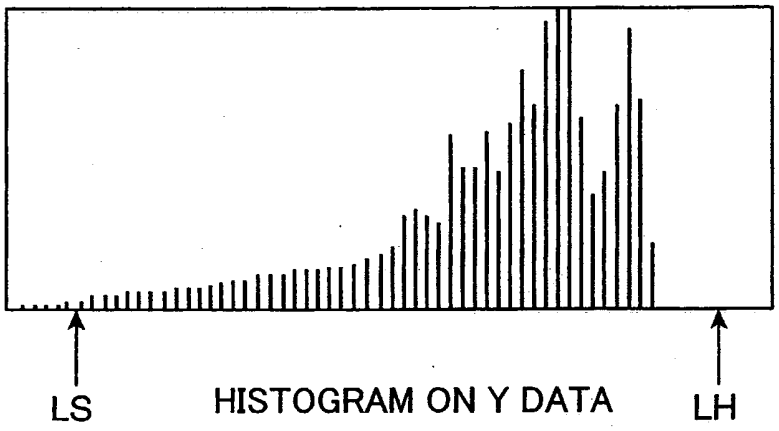


FIG.24

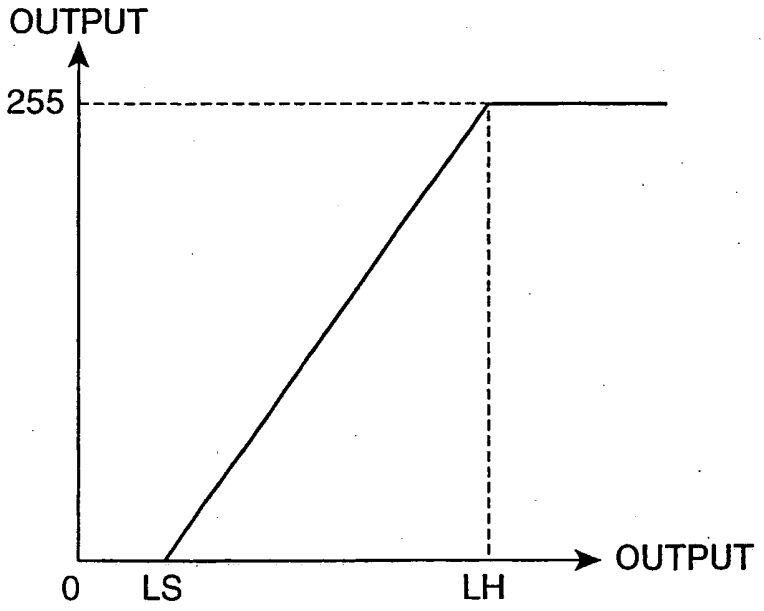


FIG.25

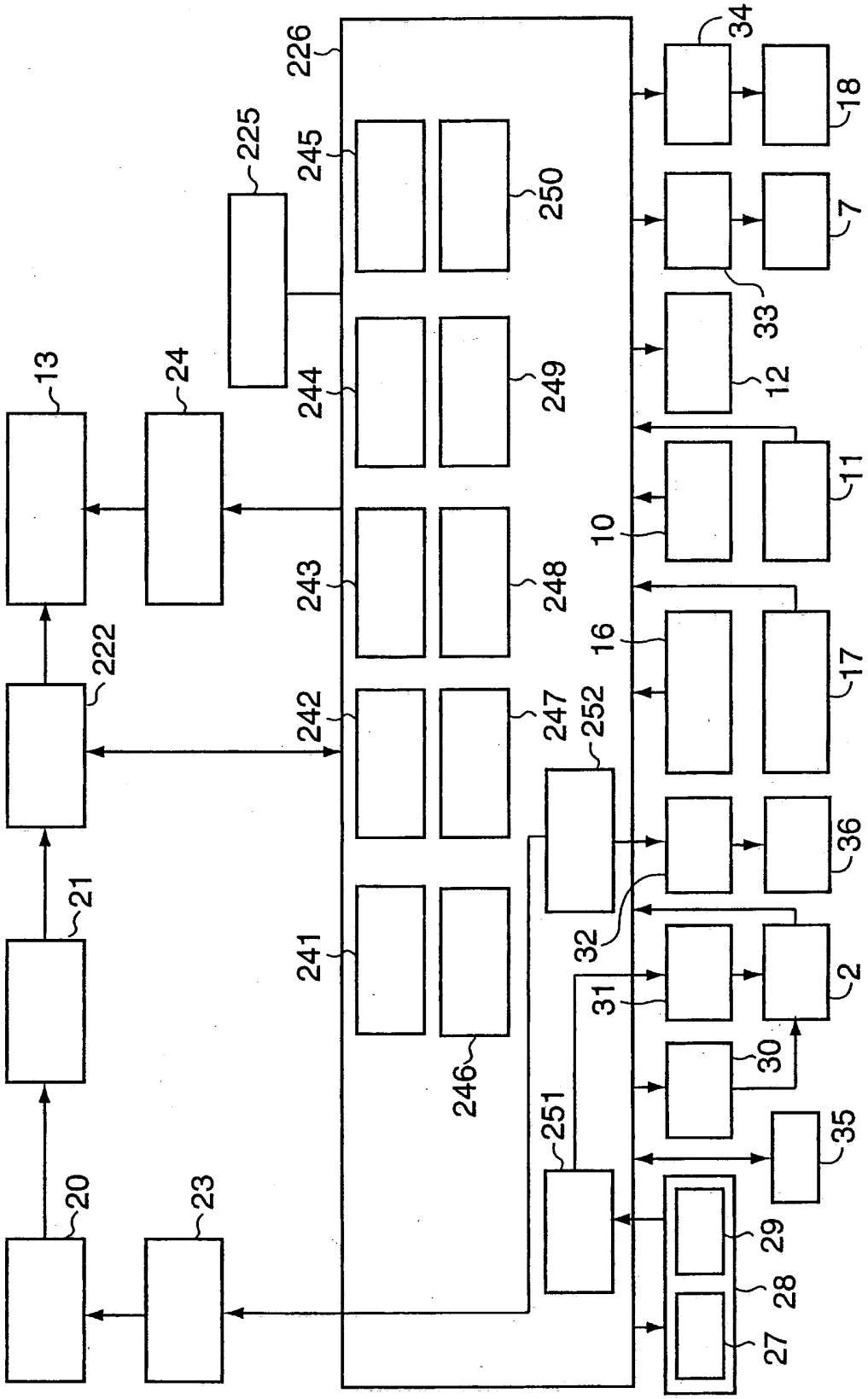

200
13
24
225
226
245
250
244
249
243
248
242
247
241
246
222
21
20
23
252
251
16
17
10
11
12
33
34
18
7
36
32
31
2
30
35
29
28
27

FIG.26

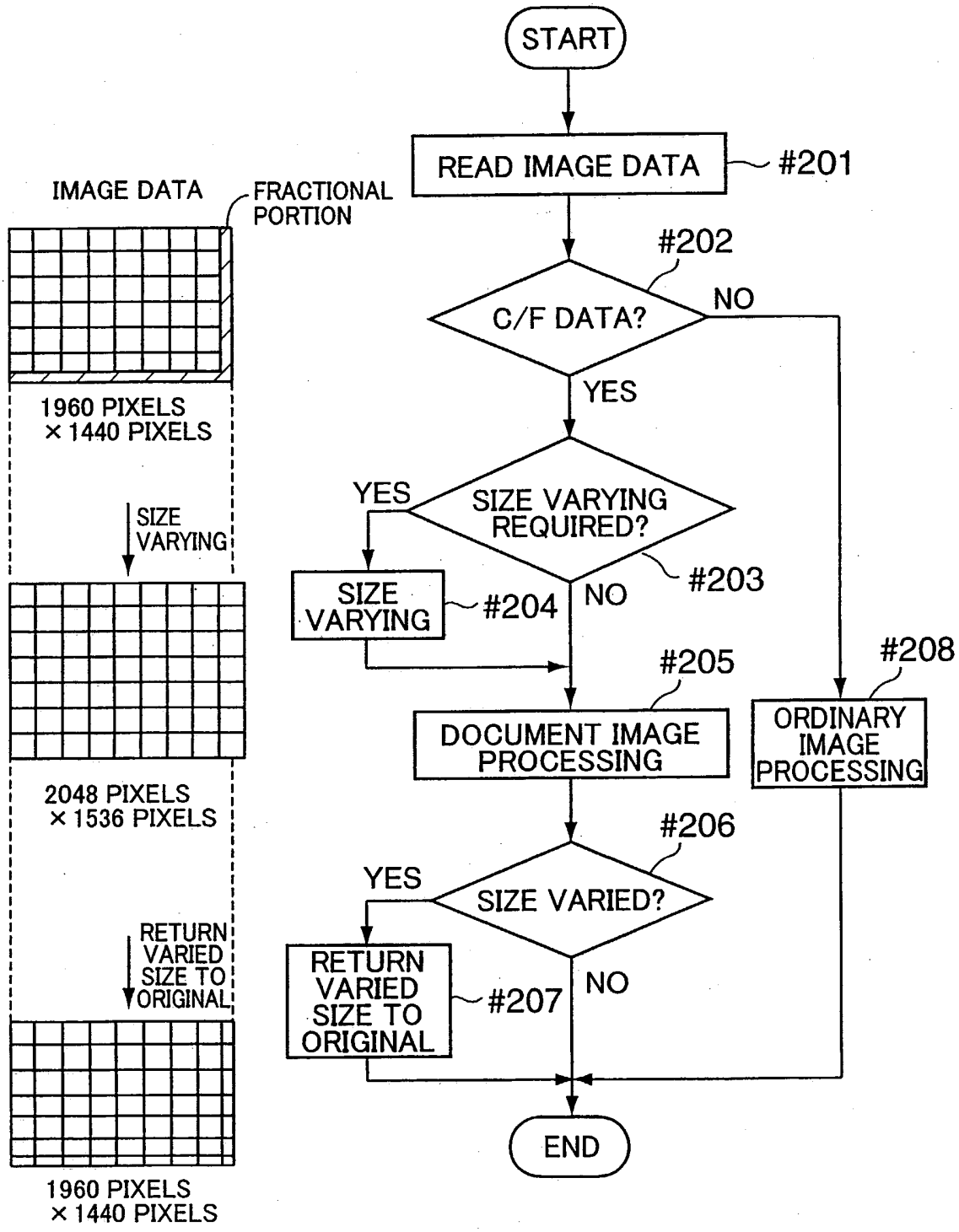


IMAGE DATA
FRACTIONAL PORTION
1960 PIXELS
× 1440 PIXELS
SIZE VARYING
2048 PIXELS
× 1536 PIXELS
RETURN VARIED SIZE TO ORIGINAL
1960 PIXELS
× 1440 PIXELS
START
READ IMAGE DATA
#201
#202
C/F DATA?
NO
YES
YES
SIZE VARYING REQUIRED?
#203
NO
SIZE VARYING
#204
#205
DOCUMENT IMAGE PROCESSING
#208
ORDINARY IMAGE PROCESSING
#206
YES
SIZE VARIED?
NO
RETURN VARIED SIZE TO ORIGINAL
#207
END

FIG.27

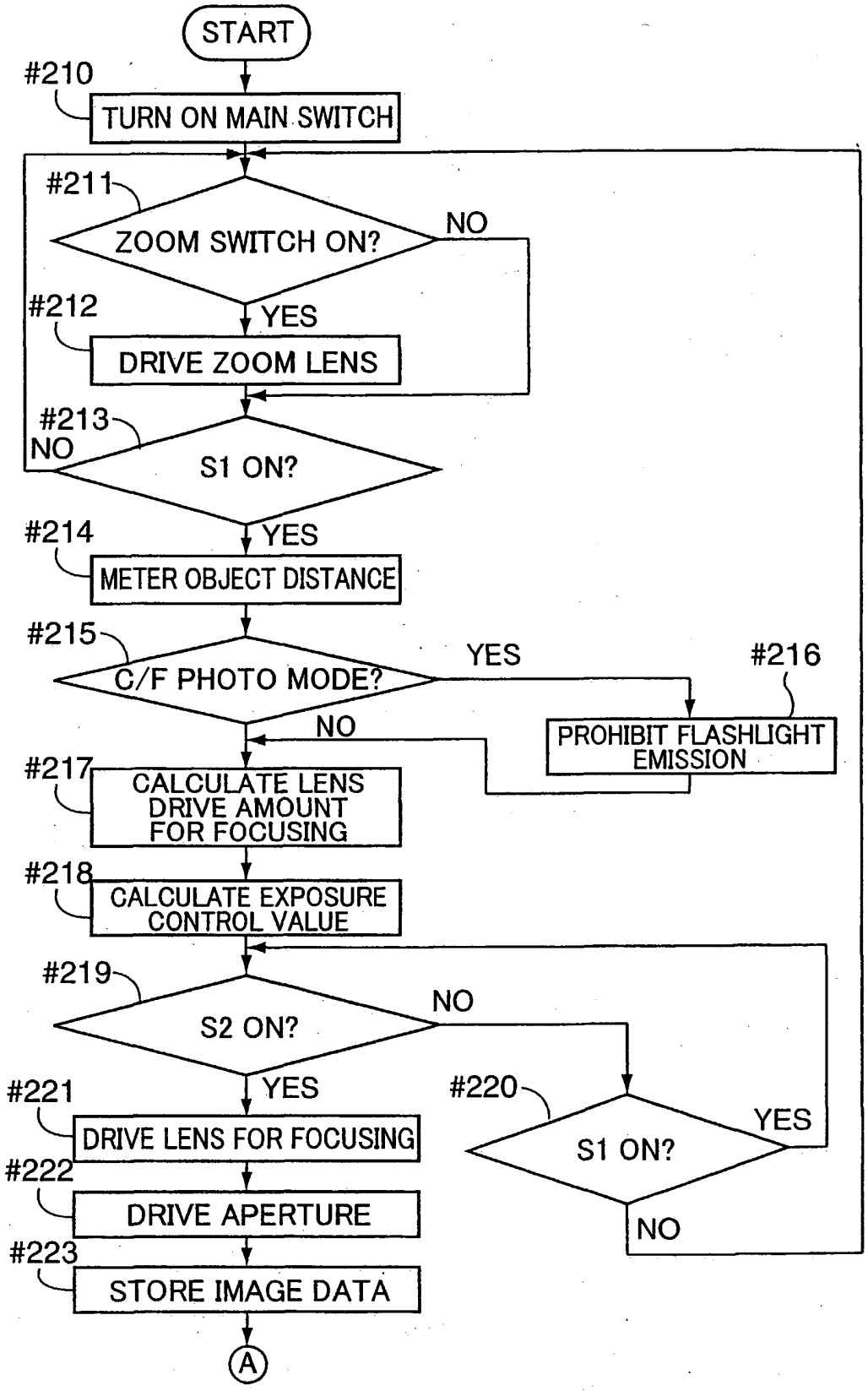

START
#210
TURN ON MAIN SWITCH
#211
ZOOM SWITCH ON?
NO
YES
#212
DRIVE ZOOM LENS
#213
NO
S1 ON?
YES
#214
METER OBJECT DISTANCE
#215
C/F PHOTO MODE?
YES
#216
PROHIBIT FLASHLIGHT EMISSION
NO
#217
CALCULATE LENS DRIVE AMOUNT FOR FOCUSING
#218
CALCULATE EXPOSURE CONTROL VALUE
#219
S2 ON?
NO
YES
#220
S1 ON?
YES
NO
#221
DRIVE LENS FOR FOCUSING
#222
DRIVE APERTURE
#223
STORE IMAGE DATA
A

FIG.28

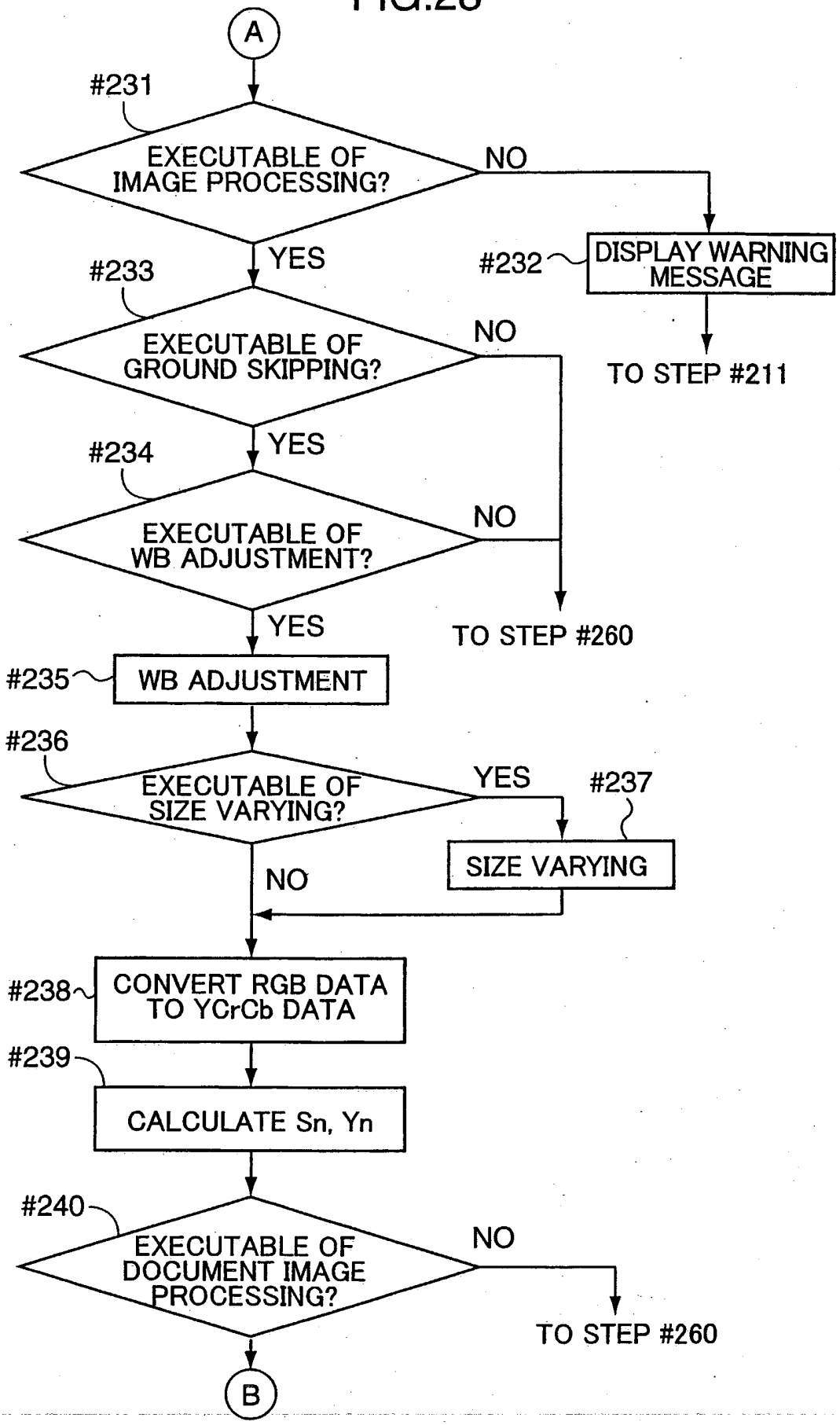

A
#231
EXECUTABLE OF IMAGE PROCESSING?
NO
YES
#232
DISPLAY WARNING MESSAGE
TO STEP #211
#233
EXECUTABLE OF GROUND SKIPPING?
NO
YES
#234
EXECUTABLE OF WB ADJUSTMENT?
NO
YES
TO STEP #260
#235
WB ADJUSTMENT
#236
EXECUTABLE OF SIZE VARYING?
YES
#237
SIZE VARYING
NO
#238
CONVERT RGB DATA TO YCrCb DATA
#239
CALCULATE Sn, Yn
#240
EXECUTABLE OF DOCUMENT IMAGE PROCESSING?
NO
TO STEP #260
B

FIG.29

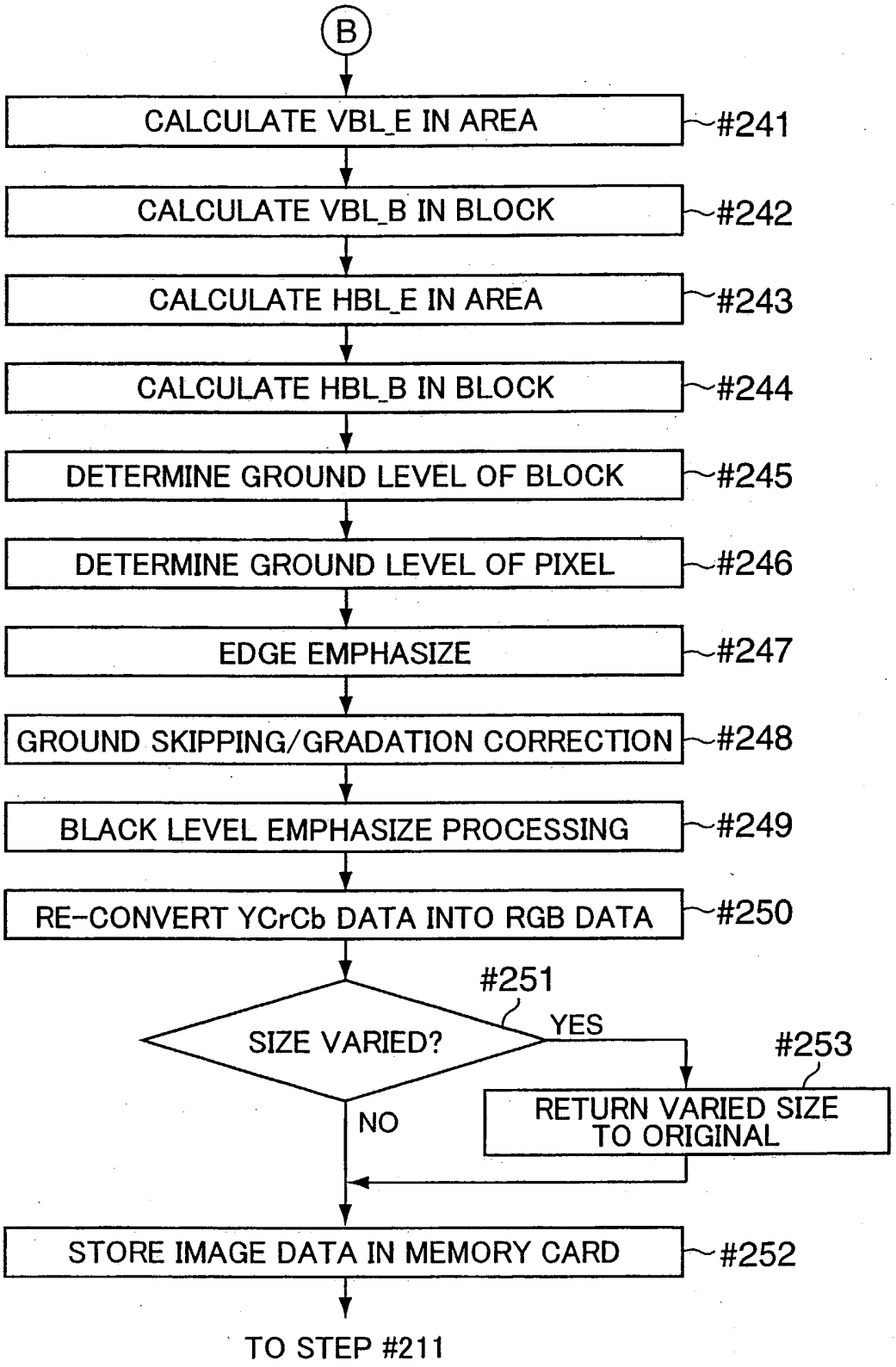

B
CALCULATE VBL_E IN AREA
#241
CALCULATE VBL_B IN BLOCK
#242
CALCULATE HBL_E IN AREA
#243
CALCULATE HBL_B IN BLOCK
#244
DETERMINE GROUND LEVEL OF BLOCK
#245
DETERMINE GROUND LEVEL OF PIXEL
#246
EDGE EMPHASIZE
#247
GROUND SKIPPING/GRADATION CORRECTION
#248
BLACK LEVEL EMPHASIZE PROCESSING
#249
RE-CONVERT YCrCb DATA INTO RGB DATA
#250
#251
SIZE VARIED?
YES
#253
RETURN VARIED SIZE TO ORIGINAL
NO
STORE IMAGE DATA IN MEMORY CARD
#252
TO STEP #211

FIG.30

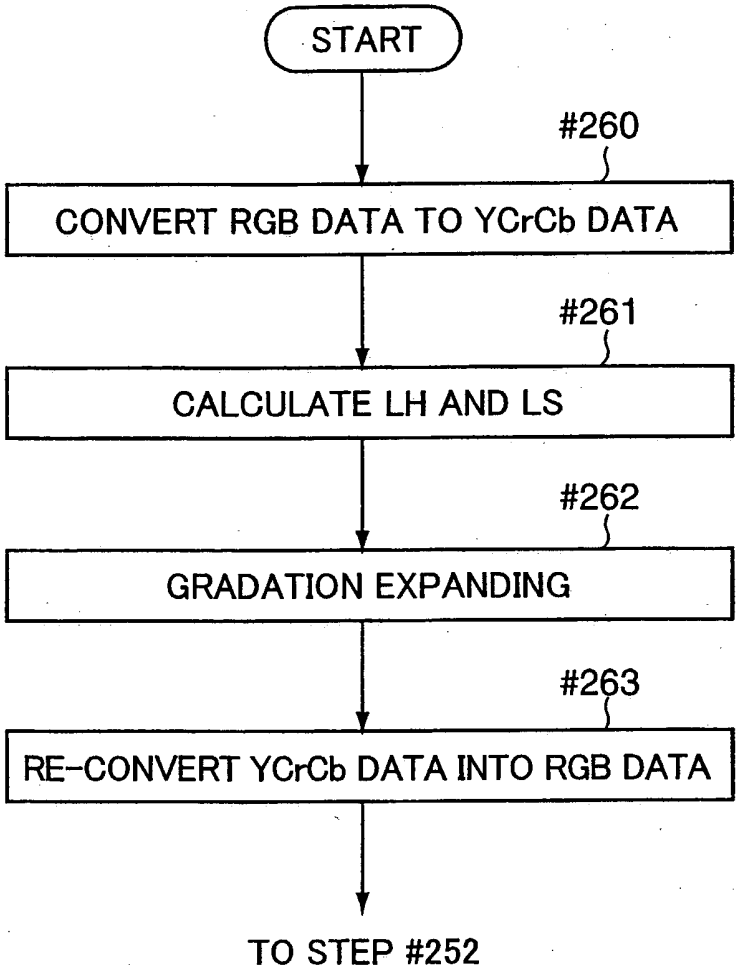

START
#260
CONVERT RGB DATA TO YCrCb DATA
#261
CALCULATE LH AND LS
#262
GRADATION EXPANDING
#263
RE-CONVERT YCrCb DATA INTO RGB DATA
TO STEP #252

FIG.31

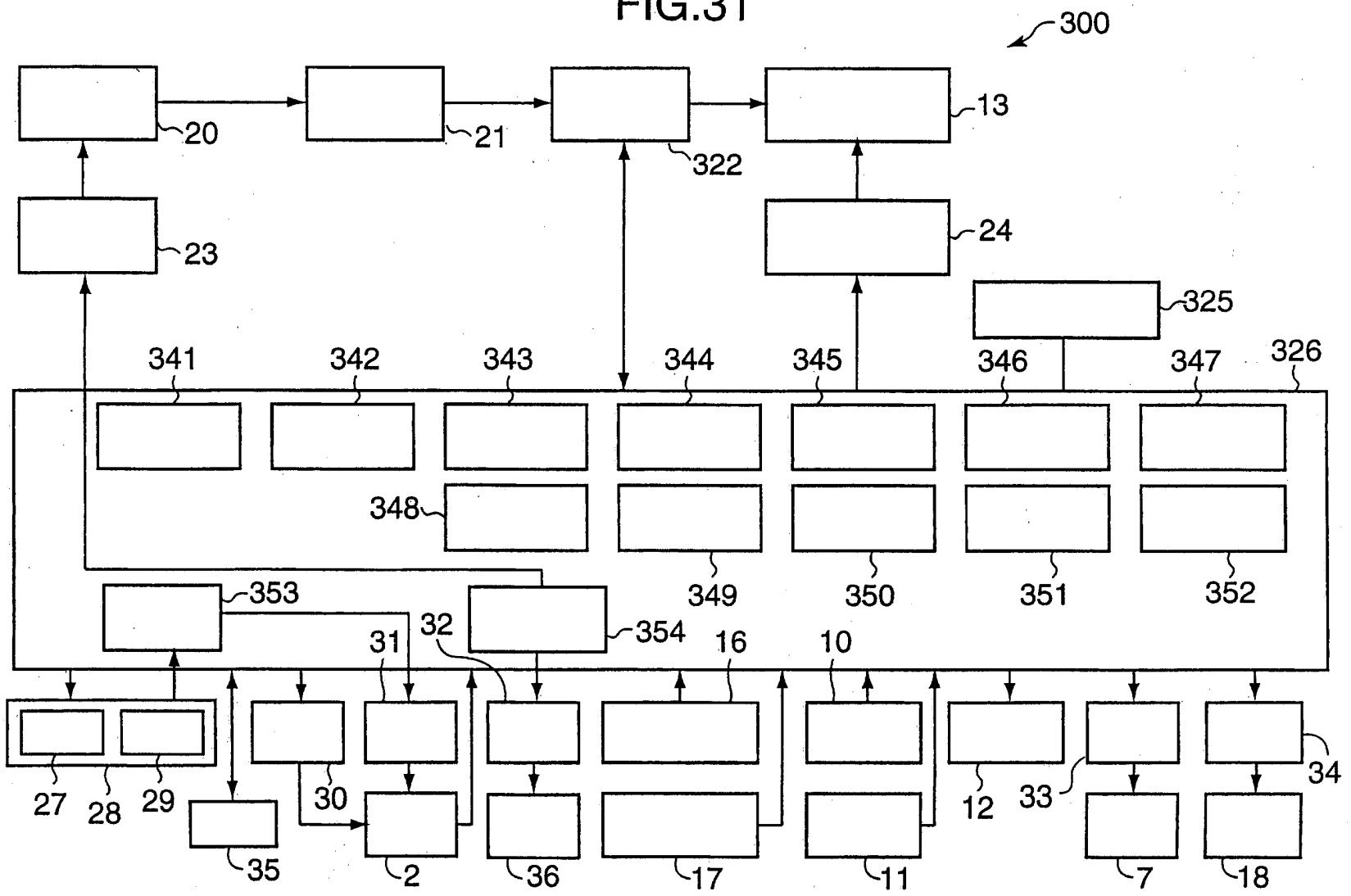

300
20
21
322
13
23
24
325
341
342
343
344
345
346
347
326
348
349
350
351
352
353
354
31
32
16
10
27
28
29
30
35
2
36
17
11
12
33
34
7
18

FIG.32

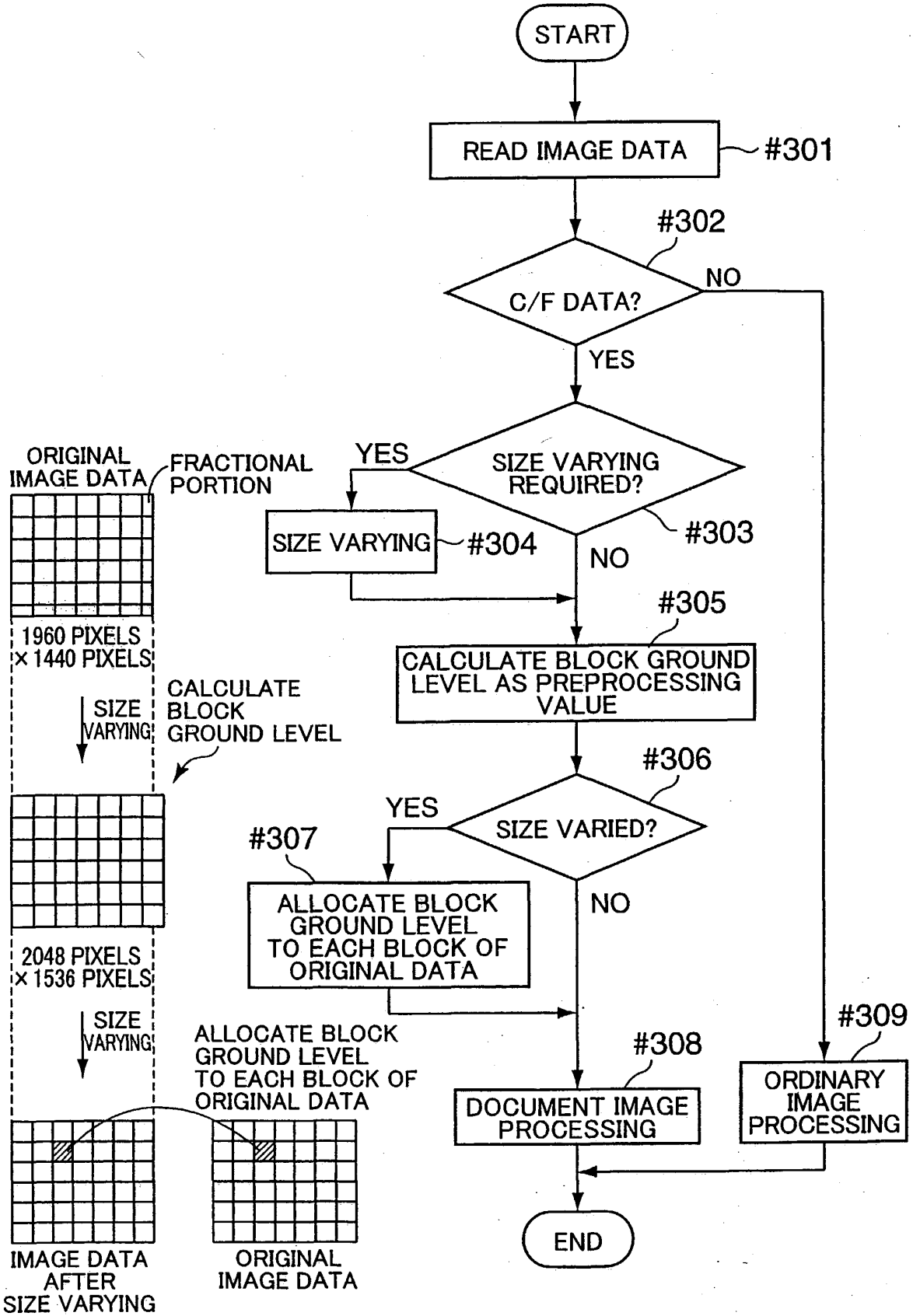

START
READ IMAGE DATA
#301
#302
C/F DATA?
NO
YES
SIZE VARYING REQUIRED?
YES
#303
SIZE VARYING
#304
NO
#305
CALCULATE BLOCK GROUND LEVEL AS PREPROCESSING VALUE
#306
SIZE VARIED?
YES
#307
ALLOCATE BLOCK GROUND LEVEL TO EACH BLOCK OF ORIGINAL DATA
NO
#308
DOCUMENT IMAGE PROCESSING
#309
ORDINARY IMAGE PROCESSING
END
ORIGINAL IMAGE DATA
FRACTIONAL PORTION
1960 PIXELS × 1440 PIXELS
SIZE VARYING
CALCULATE BLOCK GROUND LEVEL
2048 PIXELS × 1536 PIXELS
SIZE VARYING
ALLOCATE BLOCK GROUND LEVEL TO EACH BLOCK OF ORIGINAL DATA
IMAGE DATA AFTER SIZE VARYING
ORIGINAL IMAGE DATA

FIG.33

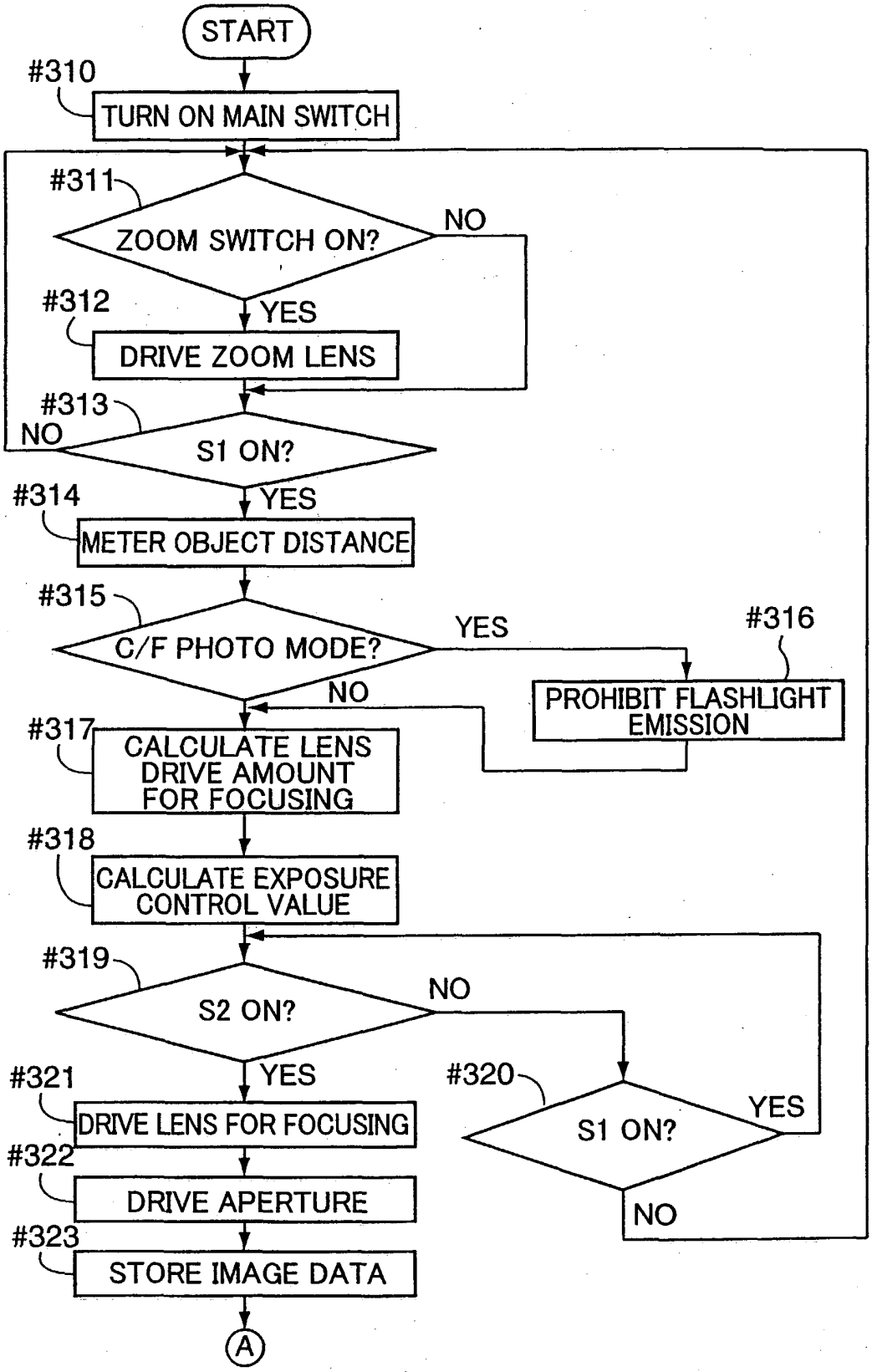

START
#310
TURN ON MAIN SWITCH
#311
ZOOM SWITCH ON?
NO
YES
#312
DRIVE ZOOM LENS
#313
NO
S1 ON?
YES
#314
METER OBJECT DISTANCE
#315
C/F PHOTO MODE?
YES
#316
PROHIBIT FLASHLIGHT EMISSION
NO
#317
CALCULATE LENS DRIVE AMOUNT FOR FOCUSING
#318
CALCULATE EXPOSURE CONTROL VALUE
#319
S2 ON?
NO
YES
#320
S1 ON?
YES
NO
#321
DRIVE LENS FOR FOCUSING
#322
DRIVE APERTURE
#323
STORE IMAGE DATA
A

FIG.34

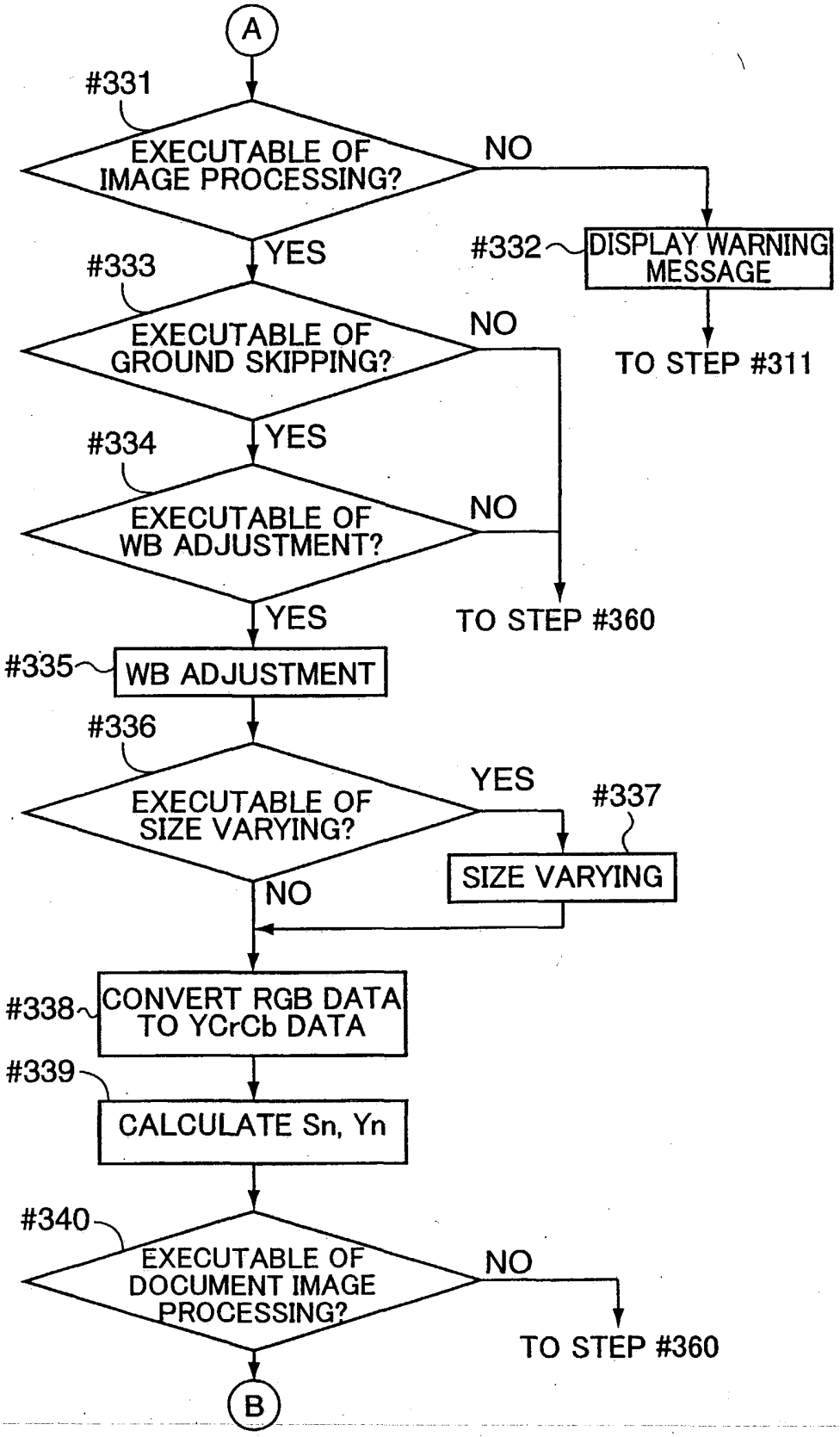

A
#331
EXECUTABLE OF IMAGE PROCESSING?
NO
#332
DISPLAY WARNING MESSAGE
TO STEP #311
YES
#333
EXECUTABLE OF GROUND SKIPPING?
NO
YES
#334
EXECUTABLE OF WB ADJUSTMENT?
NO
TO STEP #360
YES
#335
WB ADJUSTMENT
#336
EXECUTABLE OF SIZE VARYING?
YES
#337
SIZE VARYING
NO
#338
CONVERT RGB DATA TO YCrCb DATA
#339
CALCULATE Sn, Yn
#340
EXECUTABLE OF DOCUMENT IMAGE PROCESSING?
NO
TO STEP #360
B

FIG.35

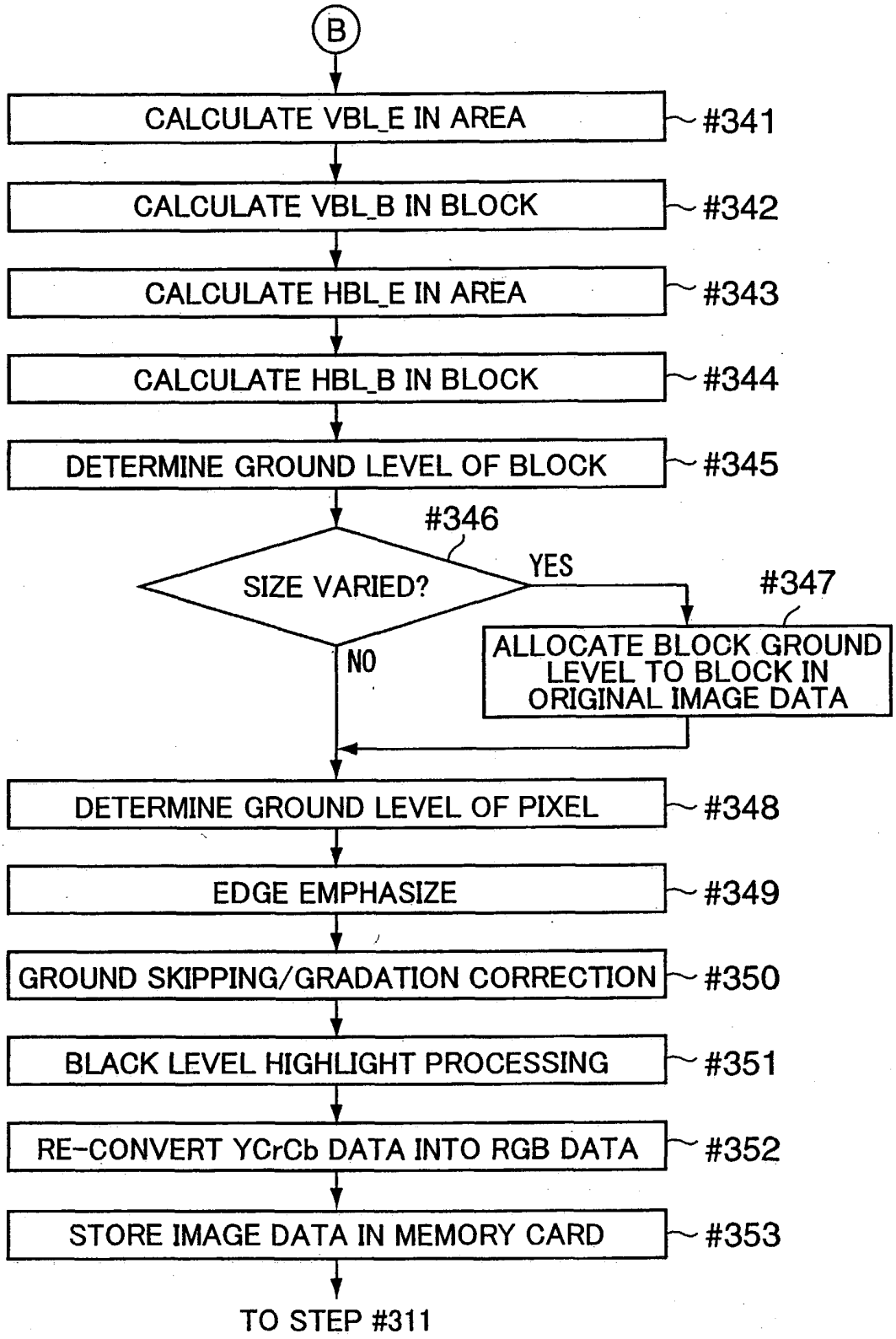

B
CALCULATE VBL_E IN AREA
#341
CALCULATE VBL_B IN BLOCK
#342
CALCULATE HBL_E IN AREA
#343
CALCULATE HBL_B IN BLOCK
#344
DETERMINE GROUND LEVEL OF BLOCK
#345
#346
SIZE VARIED?
YES
NO
#347
ALLOCATE BLOCK GROUND LEVEL TO BLOCK IN ORIGINAL IMAGE DATA
DETERMINE GROUND LEVEL OF PIXEL
#348
EDGE EMPHASIZE
#349
GROUND SKIPPING/GRADATION CORRECTION
#350
BLACK LEVEL HIGHLIGHT PROCESSING
#351
RE-CONVERT YCrCb DATA INTO RGB DATA
#352
STORE IMAGE DATA IN MEMORY CARD
#353
TO STEP #311

FIG.36

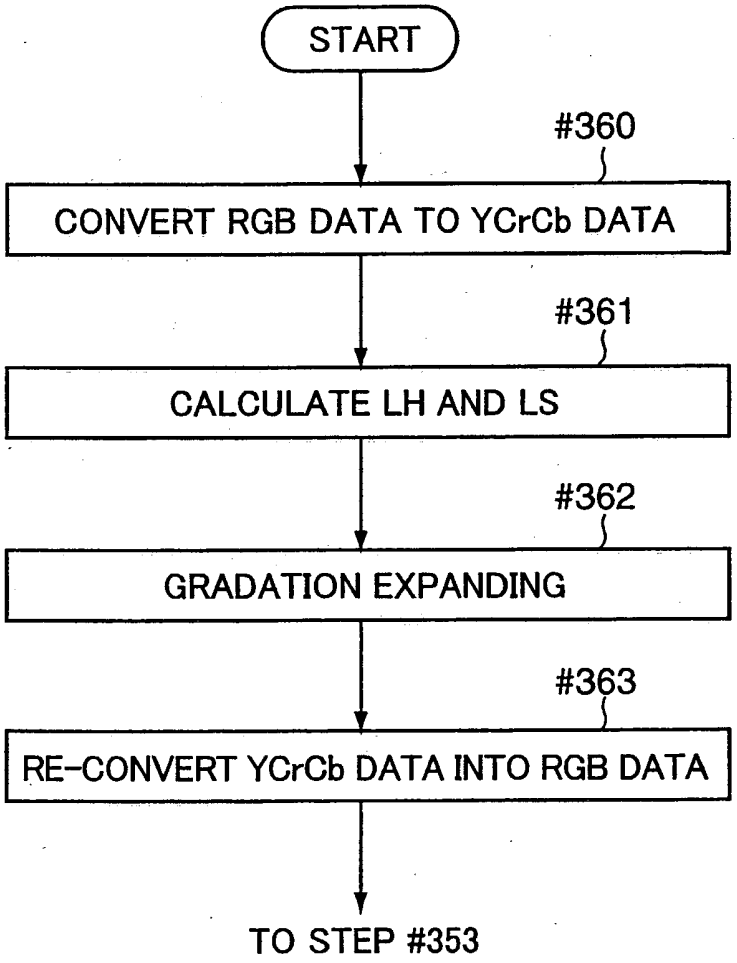

START
#360
CONVERT RGB DATA TO YCrCb DATA
#361
CALCULATE LH AND LS
#362
GRADATION EXPANDING
#363
RE-CONVERT YCrCb DATA INTO RGB DATA
TO STEP #353

FIG.37

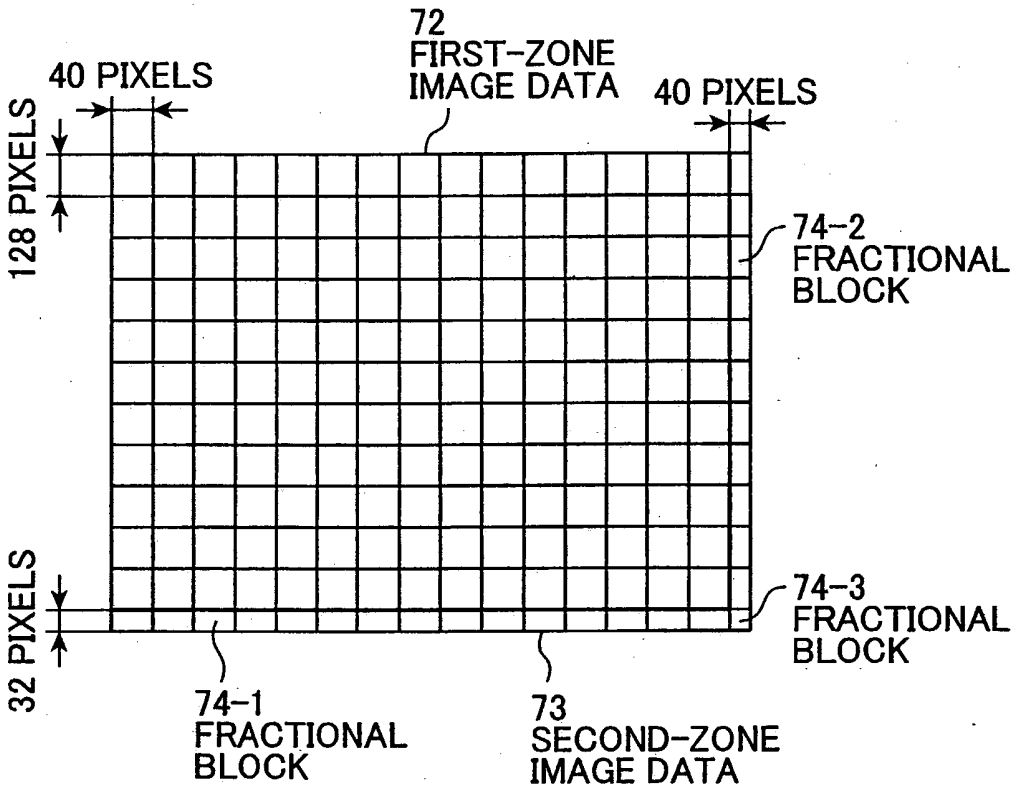
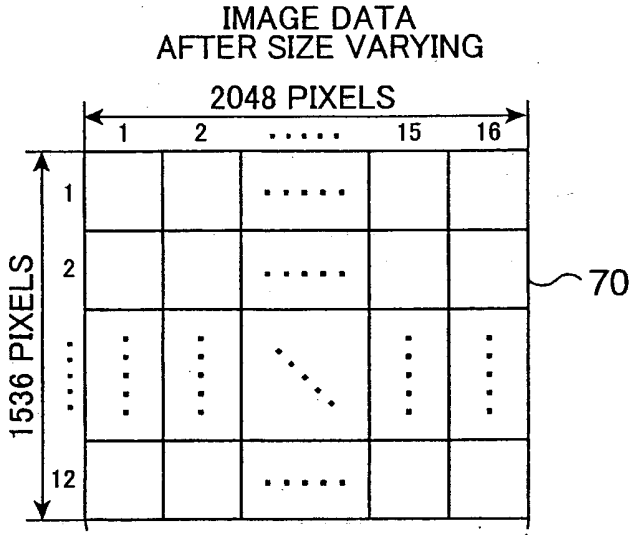

72
FIRST-ZONE
IMAGE DATA
40 PIXELS
40 PIXELS
128 PIXELS
32 PIXELS
74-2
FRACTIONAL
BLOCK
74-3
FRACTIONAL
BLOCK
74-1
FRACTIONAL
BLOCK
73
SECOND-ZONE
IMAGE DATA

FIG.38A



RETURN IMAGE SIZE
TO ORIGINAL

FIG.38B

ALLOCATE BLOCK GROUND
LEVEL TO CORRESPONDING
BLOCK IN ORIGINAL
IMAGE DATA

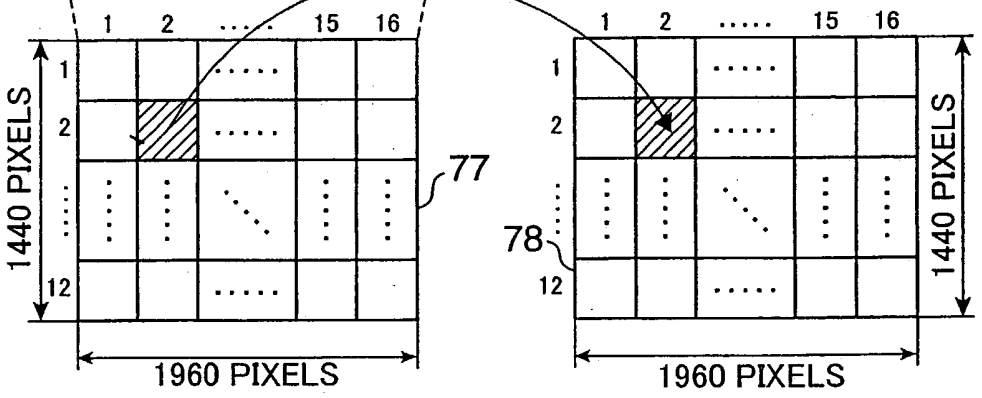


IMAGE DATA
AFTER SIZE RE-VARYING

ORIGINAL
IMAGE DATA